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ABSTRACT

This report summarizes the results of the National Science Foundation's biennial Survey of Science Activities of Institution of Higher Education which collected information on January, 1969, employment and academic year 1967-68 financing in the sciences and engineering in 2,175 universities and colleges with such programs. The report gives special attention to trends in utilization of resources by science field (life science, physical science, social science, psychology, engineering, and mathematics), type of institution, geographical area, and sources of financing. Details regarding the scope, coverage, methods of estimating and limitations of the survey are presented in the technical notes in appendix A. Other appendices contain the consolidated questionnaires summarizing survey data for selected categories of institutions: 2,175 universities and colleges, 101 medical schools, and 36 university-administered FFRDC's. (Author/PR)

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Resources for Scientific Activities at Universities and Colleges
1969

Surveys of Science Resources Series
NATIONAL SCIENCE FOUNDATION
NSF 70-16

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GENERAL NOTES

- Statistics shown in this report may not add to totals or subtotals because of rounding.
- Percentages were calculated on the basis of statistical aggregates reported in the survey (employment figures in units and financial data in thousands of dollars) and may differ from percentages based on rounded figures.
- All percentage changes in trend statistics represent compound annual rates.
- Employment figures for 1965, 1967, and 1969 relate to January of the designated year, while employment figures cited for 1958 and 1961 relate to March of the designated year.
- Financial data for 1968 relate to academic year 1967–68. Data for other academic years are identified similarly. Data for each of the years covered in this report are shown in current dollars; thus, trend data on R&D and other scientific expenditures do not take into account changes that have occurred in the purchasing power of the dollar.
- The term "outlying areas" includes the Canal Zone, Guam, Puerto Rico, and the Virgin Islands.

Resources for Scientific Activities at Universities and Colleges
1969

Report on a Survey
of 1969 Employment
and 1968 Expenditures

Surveys of Science
Resources Series

NATIONAL SCIENCE FOUNDATION

NSF 70-16

DEFINITIONS

Universities and colleges include institutions of higher education in the United States and outlying areas offering at least a 2-year resident program of college-level studies and meeting criteria for listing in directories of higher education published periodically by the U.S. Office of Education. As defined for this report, "universities and colleges" include all organizational units of such institutions except university-administered FFRDC's, which are described below.

University-administered Federally Funded Research and Development Centers (FFRDC's) are organizations exclusively or substantially financed by the Federal Government, in most instances established to meet an R&D need of the Federal Government, and administered by individual universities or university consortia. (List for academic year 1967–68 shown in appendix D.)

Scientists and engineers include employees of an institution, except graduate students compensated for part-time services, who have received a bachelor's degree, or have the equivalent in training or experience, and are working at a professional level (a level at which knowledge at least equivalent to that obtained in a 4-year bachelor's degree program is essential to the performance of duties in the sciences or engineering). For the purposes of this report, statistics on graduate students receiving salaries, wages, or other duty stipends for part-time services as scientists and engineers (such as teaching and research assistants) are shown separately in section 2.

Current R&D expenditures include both direct and indirect costs of research and development in the sciences and engineering performed by universities and colleges. Included are separately budgeted research and development, for which universities and colleges normally maintain precise records, and the estimated expenditures for departmental research and other costs associated with R&D performance, for which most institutions do not maintain records.

Current expenditures for separately budgeted research and development refer to R&D projects for which exact accountability for expenditures is maintained by universities and colleges. Such expenditures are made from funds specifically designated for R&D performance through gifts, grants, and contracts, or earmarked for such a purpose by the university or college.

Current expenditures for instruction and departmental research include all direct and indirect expenditures incurred in instructional programs for resident, degree-credit courses of study in the sciences and engineering. Included are salaries of department heads, faculty members, and secretaries and technicians; costs of office and laboratory materials and supplies; and other direct and indirect expenses. The departmental research portion was defined for this survey as research that is carried on in connection with the teaching function and is funded without separate financial records in the departmental budgets rather than being allocated from restricted funds, as defined above for separately budgeted research.

Capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction include funds for facilities that were in process or completed in academic years 1967–68. Facilities and equipment are defined to include buildings, fixed equipment, movable furnishings, architects' fees and related costs, and special separate facilities to house scientific apparatus.

NOTE:—Other and more detailed definitions are included in the survey instructions in appendix E.

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Foreword

PUBLIC AWARENESS of the importance of science and technology in all facets of life has stimulated wide interest in the science and engineering programs of the Nation's universities and colleges. Public interest in such matters manifested itself in progressively increasing financial support of academic science by all levels of government in the early and mid-1960's. However, we now seem to be in a period where Federal funding of academic science has leveled off and actually supports a decreasing level of activity. Consequently, it is more important than ever to develop information which provides insight into the nature and distribution of academic science resources.

Issues associated with the financial needs of higher education to accommodate increased enrollments, to provide expanded research and public service activities, and to achieve and maintain excellence tend to receive national attention because of the heavy dependence of universities and colleges on outside sources of support, both public and private. The fact that universities and colleges utilize a relatively small proportion of the Nation's science resources, whether measured in manpower or financial terms, is frequently overlooked. For example, their faculties and other professional staffs include only one-sixth of American scientists and engineers. Similarly, universities and colleges account annually for only one-tenth of the Nation's R&D performance measured in dollar terms.

This report summarizes the results of the National Science Foundation's biennial Survey of Scientific Activities of Institutions of Higher Education, which collected information on January 1969 employment and academic year 1967–68 financing in the sciences and engineering in the 2,175 universities and colleges with such programs. The report gives special attention to trends in utilization of resources by field of science, type of institution, geographical area, and source of financing. It should be noted, however, that survey findings presented in this report do not reflect fully the slackening of Federal support of academic science that occurred in the late 1960's and that has continued since then. Thus, according to data reported in NSF Federal Funds surveys, Federal R&D obligations at universities and colleges increased less than 1 percent between fiscal years 1968 and 1970.

The survey on which this report is based is part of a series of recurring NSF studies covering all sectors of the U.S. economy, including industry, government, and independent nonprofit organizations. These studies are designed to yield data on the principal economic characteristics of the

Nation's investment in science and technology. Such information is useful to officials of public and private organizations concerned with planning and administering policies and programs to strengthen the Nation's scientific and technological capabilities.

The report was prepared in the National Science Foundation's Office of Economic and Manpower Studies, Thomas J. Mills, Head. Assistance in compiling the mailing list and other aspects of the survey by officials of the U.S. Office of Education is gratefully acknowledged. The National Science Foundation also appreciates the cooperation of officials of universities and colleges who provided the information upon which this report is based.

MAY 1970

CHARLES E. FALK
Head
Office of Economic, Manpower,
and Special Studies
National Science Foundation

Acknowledgments

This report was prepared in the Office of Economic and Manpower Studies under the guidance of Kenneth Sanow, Head, Statistical Surveys and Reports Section. The survey was conducted and the report prepared under the direction of Joseph H. Schuster, Study Director, Universities and Nonprofit Institutions Studies Group. Ronald S. Biggar, Jr., carried out major responsibilities during all phases of the survey and in the preparation of the report. Lester Friedman, Penny D. Foster, and James G. Huckenpahler contributed to all aspects of the survey, including the writing of particular sections of the report. Barbara H. Alston provided the clerical assistance required for the survey.

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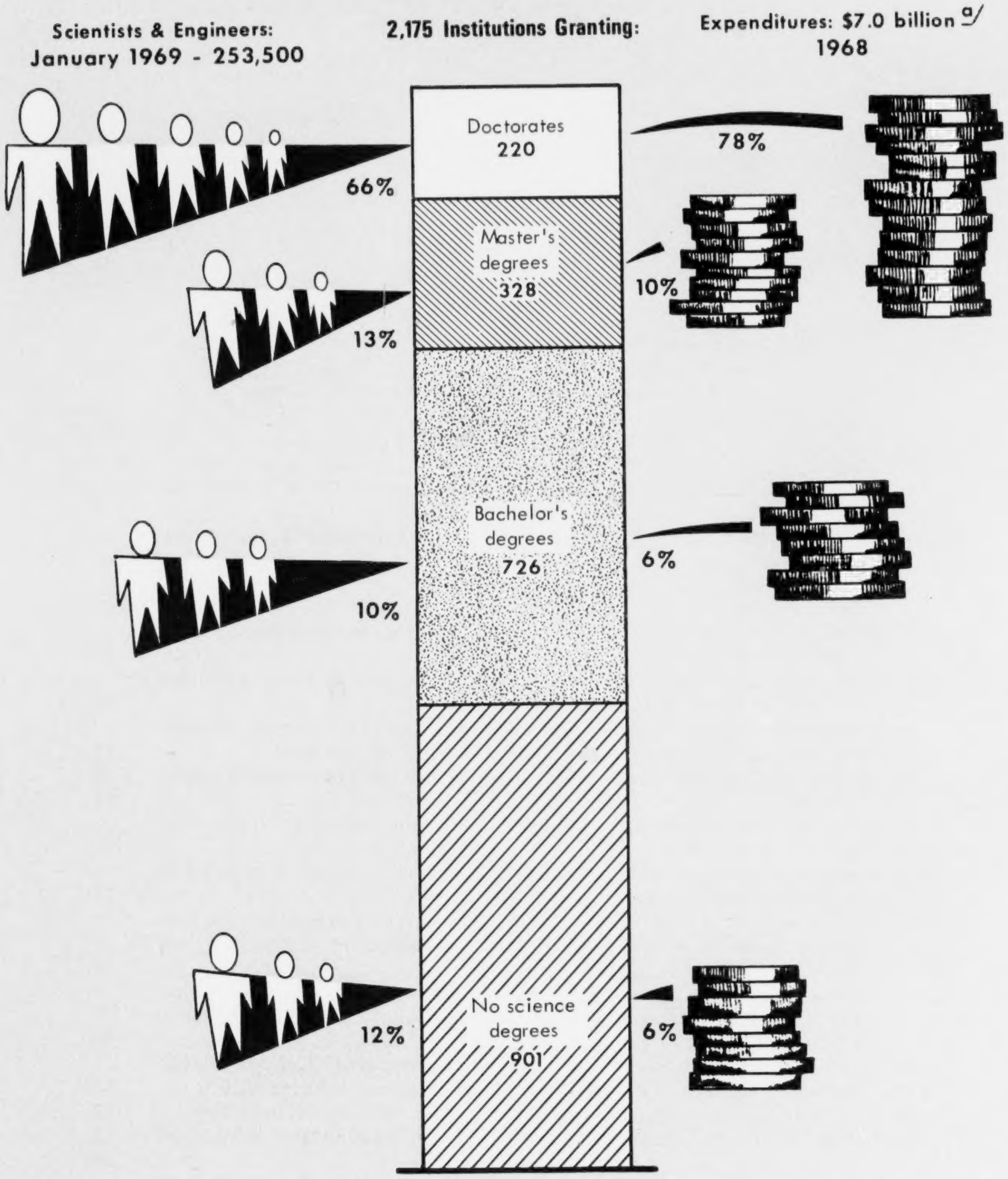
Distribution of scientists and engineers and expenditures at universities and colleges, by type of institution.



[a] Current and capital expenditures for research, development, and instruction in the sciences and engineering.

Source: National Science Foundation.

Summary

Universities and Colleges[1]

Scientists and engineers.—The 253,500 full- and part-time scientists and engineers employed in the Nation's universities and colleges in 1969 represented an increase of 8.1 percent per year over the 217,200 total for 1967, compared with a 6.9-percent yearly rate of increase that prevailed during 1958–67.

Throughout the 11-year span from 1958–69, the employment of scientists and engineers increased in each of the functional categories for which separate data were collected. In full-time-equivalent (FTE) terms, the growth rate in teaching averaged 10.5 percent per year during 1967–69, compared with 6.7 percent per year during 1958–67. In contrast, FTE's engaged in R&D performance increased 5.7 percent per year from 1958 to 1967, but averaged only 2.9 percent per year during 1967–69, reflecting the leveling off of Federal R&D support to universities and colleges that occurred in the late 1960's.

The personnel distribution was as follows: doctorate institutions, 66 percent; master's institutions, 13 percent; bachelor's institutions, 10 percent; and institutions not granting science degrees, 12 percent.

Life scientists comprised more than two-fifths (41 percent) of the professional science and engineering staff. Disciplines ranking next were social scientists, 21 percent; physical scientists, 14 percent; engineers, 10 percent; mathematicians, 9 percent; and psychologists, 6 percent.

The distribution of scientists and engineers in 1969, by highest earned degree, was Ph. D., 43 percent; M.D. or other health-professional doctorate, 18 percent; master's, 29 percent; and bachelor's or the equivalent, 10 percent.

In full-time-equivalent terms, universities and colleges employed 222,900 scientists and engineers in 1969. These FTE's were distributed among teaching, 65 percent; research and development, 23 percent; and other activities, 12 percent.

Graduate students.—Universities and colleges supported 84,400 graduate students as teaching and research assistants in 1969, an increase of 7.3 percent per year over the 1967 total. On an FTE basis, the number engaged in teaching increased at a rate of 11 percent per year during 1958–67 and 12 percent during 1967–69. However, the increase in FTE graduate students engaged in R&D performance dropped from 9.8 percent per year during 1958–67 to 2.1 percent per year in the latter period.

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[1] See p. ii for definitions of terms used in this report.

Technicians.—In 1969 technicians in the sciences and engineering numbered 48,500, of whom 70 percent were primarily engaged in R&D work. Life sciences was the dominant field, accounting for more than two-thirds of total technician employment in universities and colleges.

Expenditures for scientific activities.—Universities and colleges expended $7 billion for scientific activities in 1968, including current R&D expenditures, $2.6 billion (37 percent) ; current instruction expenditures, $3.3 billion (47 percent) ; and capital expenditures, $1.1 billion (15 percent).

In contrast to the rapid growth during 1958–66—when current R&D expenditures increased at a rate of 17 percent per year, these expenditures slowed to a rate of 11.7 percent per year during 1966–68, reflecting the start of the general leveling off of Federal funding.

Scientific activity expenditures were distributed, by type of institution, as follows: doctorate institutions, 78 percent; master's, 10 percent; bachelor's, 6 percent; and institutions not granting science degrees, 6 percent.

Federally Funded Research and Development Centers (FFRDC's) Administered by Universities and University Consortia

Scientists and engineers.—Employment of scientists and engineers in the 36 university-administered FFRDC's totaled 11,500 in 1969, an increase of 3.5 percent per year over the employment level in 1967. Nearly all of these personnel were employed full time and were primarily engaged in research and development.

Graduate students.—Graduate students receiving stipends for part-time services as scientists or engineers totaled 900 in 1969. All were engaged in research and development, and the majority (57 percent) were in the physical sciences.

Technicians.—Technician employment totaled 9,100 in 1969, nearly all of whom were engaged in research and development in engineering and the physical sciences.

Expenditures for scientific activities.—R&D outlays in university-administered FFRDC's totaled $855 million in 1968, virtually all of which was financed by sponsoring Federal agencies. This included $719 million for current R&D expenditures (84 percent of the total) and $136 million for capital outlays (16 percent). As was the case with universities and colleges, the leveling off in the growth of Federal R&D funding in the late 1960's also affected FFRDC's. The annual rate of increase in current R&D expenditures in FFRDC's during 1966–68 was 6.9 percent, as compared with the 10.0-percent annual rate of increase during 1958–66.

Introduction

THIS REPORT summarizes the results of the National Science Foundation's 1969 survey of the scientific activities of institutions of higher education. The survey obtained information on 1969 employment of scientific and technical personnel and 1968 financing of scientific and engineering activities. The survey was comparable in scope and coverage to previous NSF surveys for 1964 and 1966, but somewhat more comprehensive in terms of scientific activities covered than were the NSF surveys for 1954, 1958, and 1961.[2] For example, the 1961 survey was limited to manpower data only, and the financial data obtained in the 1954 and 1958 surveys were limited to current and capital R&D expenditures.

It is important to recognize that throughout this report manpower and financial characteristics of universities and colleges and university-administered Federally Funded Research and Development Centers (FFRDC's) are shown separately and are mutually exclusive. Thus, any comparisons of statistics shown in this report for universities and colleges (part I) with statistics of other organizations, such as the U.S. Office of Education, that show overall totals for higher education (including university-administered FFRDC's) should take into account the separate status of statistics on university-administered FFRDC's in part II of this report.

The survey on which this report is based is broader in scope and coverage than the annual surveys of Federal support to universities and colleges. The National Science Foundation has conducted Federal support surveys since 1966 at the request of the Federal Council on Science and Technology's (FCST) Committee on Academic Science and Engineering (CASE). Data obtained in CASE surveys differ from those presented in this report in that the former refer only to funds that are obligated to universities and colleges by the various Federal agencies rather than to total expenditures for scientific activities by universities and colleges from all sources of financing, both Federal and non-Federal. Furthermore, the survey on which this report is based obtained data on total scientific and technical personnel employed in universities and colleges. CASE manpower surveys are limited to data on scientific and technical personnel engaged in science projects financed by the Federal Government.[3]

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[2] National Science Foundation, *Scientific Research and Development in Colleges and Universities—Expenditures and Manpower, 1953–54*, 1959; *Scientific Research and Development in Colleges and Universities—Expenditures and Manpower, 1958*, 1963; *Scientists and Engineers in Colleges and Universities, 1961*, 1965; and *Scientific Activities at Universities and Colleges, 1964*, 1968. (Washington, D.C. 20402: Supt. of Documents, U. S. Government Printing Office.) The results of the 1966 survey were not published in a separate report but have been incorporated in this report on the 1969 survey.

Details regarding the scope, coverage, methods of estimating and limitations of the survey are presented in the technical notes in appendix A. Also reproduced in the appendixes are the consolidated questionnaires summarizing survey data for selected categories of institutions covered in the survey, as follows: Appendix B, 2,175 universities and colleges, including all medical schools; appendix C, 101 medical schools; and appendix D, 36 university-administered FFRDC's. Survey instructions are reproduced in appendix E.

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[3] The most recent report on the CASE survey is National Science Foundation, *Federal Support to Universities and Colleges, Fiscal Year 1968* (NSF 69-32) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969).

Part I. Universities and Colleges

SECTION 1. Scientists and Engineers

THE STRENGTH of the economy and its potential for advancement and growth are dependent upon the numbers and the quality of its scientific and technical personnel. In assuring an adequate supply of trained manpower to fill the requirements of industry, education, government, and other organizations, the faculty and other professional staff in universities and colleges play a pivotal role. To carry out their teaching, research, and public service objectives, universities and colleges utilize the services of a high proportion of the Nation's most highly qualified scientists and engineers.[4] In absolute terms, however, these professional personnel in the sciences and engineering comprise a small proportion of the Nation's scientific and technical manpower resources. The 253,500 full- and part-time scientists and engineers employed in January 1969, comprised only one-sixth of the estimated national total of 1.6 million.[5]

This section of the report summarizes the principal employment characteristics of the faculty and other professional staff engaged in teaching, research, and other activities in the sciences and engineering in the 2,175 universities and colleges with such programs in January 1969.[6] The institutions covered in the survey were classified by type based on highest degree granted in the sciences and engineering, as follows: 220 doctorate institutions; 328 master's institutions; 726 bachelor's institutions; and 901 junior colleges, technical institutes, or other institutions that do not grant science degrees (appendix table A–1). As indicated previously, statistics on graduate students receiving compensation for part-time services as scientists or engineers are not included in this section; such data are shown separately in section 2 of this report. It should also be noted that data on scientists and engineers in this section and elsewhere in part I do not include figures for university-administered FFRDC's, which are shown separately in part II of this report.

Statistics on the employment of scientists and engineers reported here are analyzed by function, level of educational attainment (highest earned degree), type of institution, disciplinary field, and geographic area. To the extent possible, statistics for 1969 are compared with data for earlier years. In section 8 of this report, data on the employment of scientists and engineers are compared with selected financial and educational characteristics classified by geographical area and by institutional group based on the amount of separately budgeted R&D expenditures.

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[4] NSF estimates for 1968, based on data from a number of sources, indicated that the universities and colleges employed around 60 percent of an estimated total of 147,000 Ph. D. scientists and engineers in that year. See National Science Foundation, *Science and Engineering Doctorate Supply and Utilization, 1968–80* (NSF 69–37) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969), p. 10.

[5] The figure for scientists and engineers does not include 84,400 graduate students who received stipends for part-time services as scientists or engineers. However, the figure does include 49,500 part-time scientists and engineers, the large majority of whom are primarily employed in other sectors of the economy, such as industry and government. The estimate of 1.6 million scientists and engineers in January 1969 was based on unpublished figures of the U. S. Bureau of Labor Statistics and related information.

[6] Employment statistics cited in this report for 1967 and 1969 relate to January of each year, while data for 1958 and 1961 relate to March of each year.

Employment Trends, 1958–69

The 253,500 scientists and engineers employed in universities and colleges in 1969 represented an increase of 7.1 percent per year over the 118,800 total in 1958 (table 1). This growth in employment reflects the sizable increases in teaching, research, and public service activities in the sciences and engineering during the 11-year period. According to the U.S. Office of Education, overall professional employment in higher education increased at an annual rate of 6.7 percent during 1958–69.[7]

Universities and colleges typically employ relatively large numbers of part-time faculty and other professional staff, particularly in the evening programs of institutions located in large metropolitan areas. Another sizable group of part-time staff are the health-professional personnel employed in medical schools and other organizational units as teachers or researchers in medical and health-related fields. In 1969, part-time personnel comprised 20 percent of the total employment of scientists and engineers, compared with 19 percent of the total in 1958.

In full-time-equivalent terms (FTE),[8] universities and colleges employed 222,900 scientists and engineers in 1969, an increase of 7.1 percent per year over the 104,800 FTE's in 1958. This annual rate of increase was the same as that observed earlier in actual numbers of full-time and part-time personnel. During the 11-year period, the annual rates of increase in FTE scientists and engineers by function were teaching, 7.4 percent; research and development, 5.2 percent; and other activities, 10.0 percent.

Type of Institution

The employment of scientists and engineers, as well as other aspects of scientific activities tends to be concentrated in doctorate-granting institutions (chart 1). These institutions employed 166,400 full- and part-time scientists

TABLE 1.—*Number of scientists and engineers employed in universities and colleges, by employment status, and full-time-equivalent (FTE) scientists and engineers, by function, selected years, 1958–69*

(Numbers in thousands)

Employment status and function	March 1958	March 1961	January 1965	January 1967	January 1969	Compound annual rate of increase 1958–69 (percent)
Number of scientists and engineers	118.8	139.1	188.5	217.2	253.5	7.1
Full time	96.2	112.2	147.7	172.8	204.0	7.1
Part time	22.6	26.9	40.8	44.4	49.5	7.4
FTE scientists and engineers	104.8	121.6	162.9	189.4	222.9	7.1
Teaching	66.5	77.0	103.5	119.5	145.9	7.4
Research and development	29.2	33.6	41.4	48.2	51.0	5.2
Other activities	9.1	11.0	18.0	21.6	26.0	10.0

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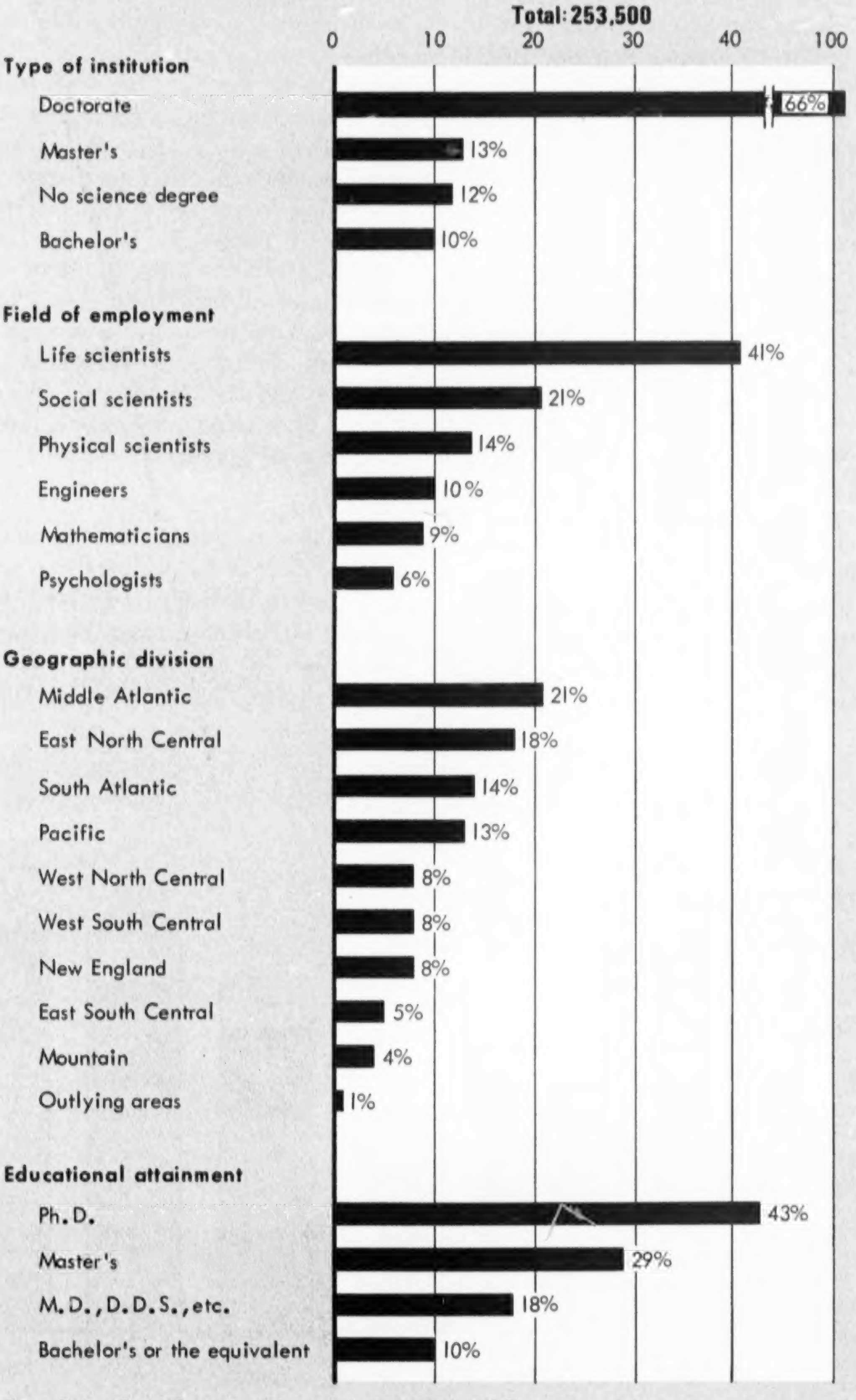
[7] Total full-time and part-time professional staff increased from 381,066 in academic year 1957–58 to an estimated 775,000 in academic year 1968–69, according to U. S. Office of Education, *Projections of Educational Statistics to 1977–78* (OE–10030–68) (Washington, D. C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969), p. 57.

[8] FTE scientists and engineers include all full-time personnel plus the full-time-equivalent of those employed part time. Institutions were requested to use their own definition of full-time employment. They were also asked to apportion the time of faculty and other professional staff among teaching, research and development, and other activities on the basis of their own estimates of the proportion of time or effort spent in each of these functions.

Chart 1.
Characteristics of scientists and engineers employed in universities and colleges, January 1969



Source: National Science Foundation (appendix tables B-1, B-2, B-5, and B-6).

and engineers, or 66 percent of the total for all institutions (appendix table B–1). Comparable figures for other types of institutions, classified by highest degree granted in the sciences and engineering, were master's, 33,200 (13 percent); bachelor's, 24,800 (10 percent); and institutions not granting science degrees, 29,200 (12 percent).

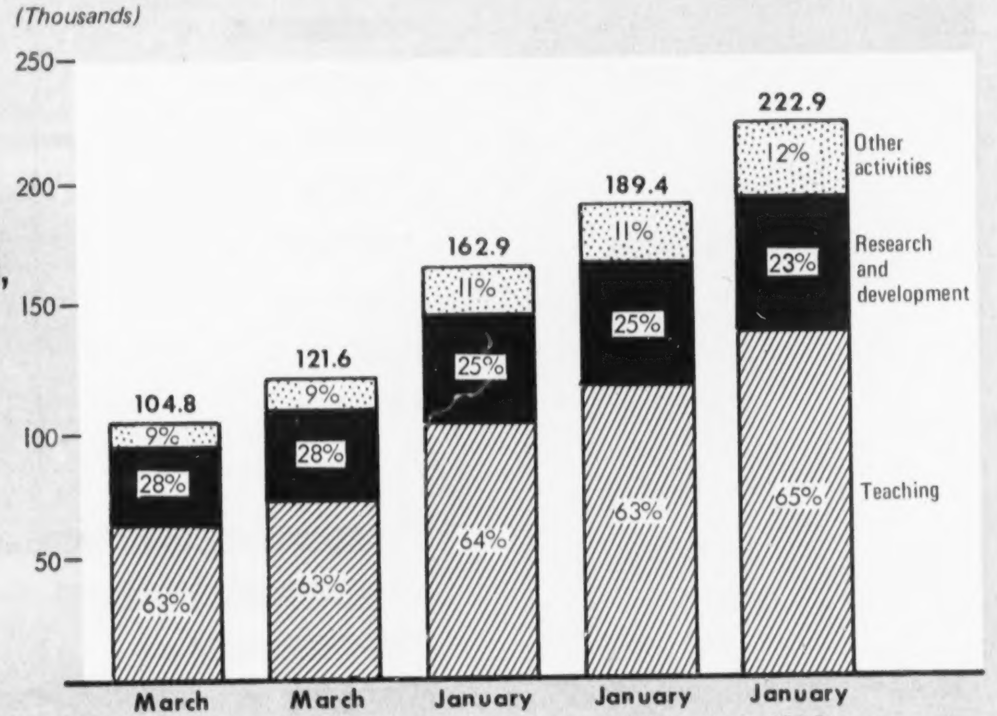
Among the factors contributing to the concentration in doctorate institutions is the relatively large number of scientists and engineers employed in university-affiliated medical schools and agricultural experiment stations. In 1969, these university-affiliated organizational components together employed an estimated 66,000 scientists and engineers, or 39 percent of the total in doctorate-granting institutions.[9]

Each of the four types of institutions relied greatly on part-time scientists and engineers in the conduct of their science and engineering programs in 1969. As might be expected, the 33,300 part-time staff of doctorate-granting institutions far exceeded the number employed by other types of institutions. Nearly one-half (48 percent) of the part-time professional staff of doctorate-granting institutions were employed in medical schools. In relative terms, however, it is noteworthy that part-time scientists and engineers comprised a higher proportion of the full- and part-time total in institutions not granting science degrees than in any of the other institutional categories. Part-time staff as a percent of total for each type of institution was as follows: Institutions not granting science degrees, 26 percent; doctorate institutions, 20 percent; bachelor's, 16 percent; and master's, 14 percent.

Function

The functional allocation of FTE scientists and engineers in universities and colleges in 1969 was as follows: Teaching, 65 percent; research and development, 23 percent; and other activities, 12 percent (chart 2). This distribution reflects the fact that during the 11-year

Chart 2.
Distribution of FTE [a] scientists and engineers employed in universities and colleges, by function, selected years, 1958-69.



[a] Full-time equivalents.
Source: National Science Foundation (table 1).

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[9] As will be discussed in greater detail in section 9, medical schools and their affiliated units employed 55,100 scientists in 1969. The survey on which this report is based did not obtain separate data on agricultural experiment stations, but, according to the U. S. Department of Agriculture, such stations employed about 11,000 R&D scientists and engineers in 1969, based on data reported in U. S. Department of Agriculture, Cooperative State Research Service, *Funds for Research at State Agricultural Experiment Stations and Other State Institutions, 1968* (CSRS 15–4) (Washington, D.C., 1969), p. 5.

TABLE 2.—*Percent distribution of FTE scientists and engineers employed in universities and colleges, by function and type of institution, January 1969*

Function	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Number (thousands)	222.9	145.9	30.5	22.4	24.2
	Percent distribution				
Teaching	65.4	50.7	90.6	95.0	95.3
Research and development	22.9	33.2	6.4	2.4	.5
Other activities	11.7	16.1	3.1	2.6	4.1

period, 1958–69, FTE's in teaching and other activities increased at somewhat faster rates than FTE's in research and development, as was noted earlier. Comparable figures for 1958 were teaching, 63 percent; research and development, 28 percent; and other activities, 9 percent.

The functional distribution of FTE scientists and engineers varied appreciably among the different types of institutions in 1969 (table 2). In doctorate-granting institutions, teaching accounted for 51 percent of the total; research and development, 33 percent; and other activities, 16 percent. In each of the other institutional types, 91 percent or more of the FTE's were in teaching, with small proportions of staff time allocated to research and development and other activities.

Since doctorate-granting institutions employ about two-thirds of the scientists and engineers in universities and colleges (66 percent in 1969), trends in the functional allocation of professional staff in such institutions greatly influence trends for the sector as a whole. In recent years, there has been a gradual shift in the relative number of FTE scientists and engineers from R&D to teaching in such institutions. The functional distribution of scientists and engineers in doctorate-granting institutions during 1965–69 was as follows:

Function	*Percent distribution*		
	January 1965 [a]	*January 1967* [a]	*January 1969*
Total	100	100	100
Teaching	48	49	51
Research and development	36	35	33
Other activities	16	16	16

[a] Based on data collected in NSF Surveys of Scientific Activities of Institutions of Higher Education, 1964 and 1966.

Educational Attainment

The classification of scientists and engineers by highest earned degree was as follows: Ph. D., 107,900 (43 percent) ; M.D. or health-professional doctorate, 45,600 (18 percent) ; master's, 73,900 (29 percent) ; and bachelor's or the equivalent, 26,200 (10 percent). The large number of faculty and other professional staff with M.D. or other health-professional doctorates shows the importance of medical education and research in institutions of higher education. Medical schools employed 85 percent of the total professional staff holding the M.D. or other health-professional doctorate.

The academic qualifications of professional staff in the sciences and engineering increased between 1967 and 1969. The proportion of scientists and engineers holding the Ph. D. increased from 41 percent to 43 percent in the 2-year period, whereas the proportion holding bachelor's degrees or the equivalent declined from 11 percent to 10 percent (table 3). The proportions of professional staff holding master's degrees (29 percent) and M.D.'s or other health-professional doctorates (18 percent) were identical in 1967 and 1969.

The level of educational attainment of professional scientific personnel differed appreciably among the different types of institutions in 1969. The earned-degree profile in doctorate-granting institutions was as follows: Ph. D., 46 percent; M.D. or other health-professional doctorate, 26 percent; master's, 16 percent; and bachelor's or the equivalent, 11 percent (chart 3). As indicated previously, the fact that medical schools are components of doctorate-granting institutions greatly influences the earned-degree profile of such institutions. Of the

TABLE 3.—*Educational attainment of scientists and engineers employed in universities and colleges, by employment status, January 1967 and January 1969*

(Thousands)

Educational attainment	Total		Full time		Part time	
	1967	1969	1967	1969	1967	1969
Total	217.2	253.5	172.8	204.0	44.4	49.5
Ph. D	88.9	107.9	79.1	96.8	9.8	11.1
M.D., D.D.S., etc	40.1	45.6	24.3	29.2	15.9	16.4
Master's	63.9	73.9	51.0	58.4	12.9	15.4
Bachelor's	24.3	26.2	18.4	19.6	5.9	6.6

55,100 scientists employed in medical schools in 1969, 70 percent held the M.D. or other health-professional doctorate.[10] It is noteworthy that the proportion of Ph. D.'s in master's-granting institutions (53 percent) was higher than in any other institutional category. However, professional staff with the M.D. or other health-professional doctorate comprised less than 1 percent of the total. In bachelor's-granting institutions and in those not granting science degrees, the majority of professional staff held master's degrees, 50 percent and 73 percent, respectively.

The level of educational attainment of full-time scientists and engineers was somewhat higher than that of part-time staff. Of the full-time staff, 47 percent held the Ph. D., and 14 percent held the M.D. or other health-professional doctorate; comparable figures for part-time scientists and engineers were 22 percent and 33 percent, respectively. The proportions of full- and part-time scientists and engineers holding master's and bachelors' degrees or the equivalent as their highest earned degrees were nearly identical.

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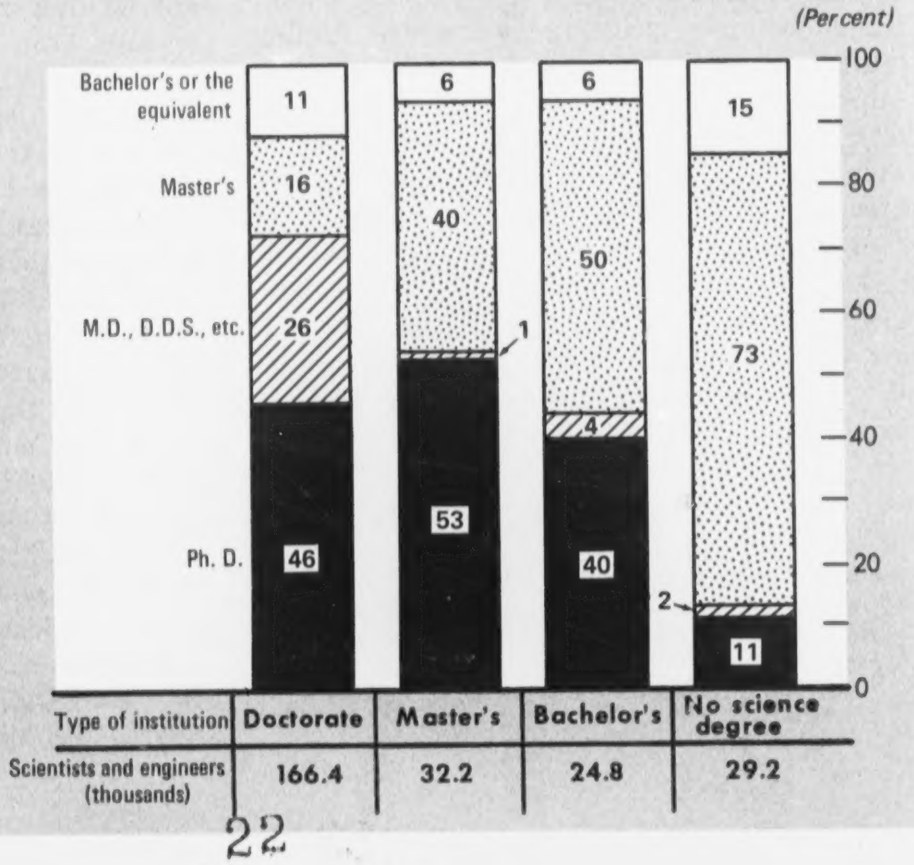
[10] See section 9 for further information on medical schools.

Chart 3. Distribution of scientists and engineers employed in universities and colleges, by type of institution and educational attainment, January 1969.



Source: National Science Foundation (appendix table B-5).

Field of Employment

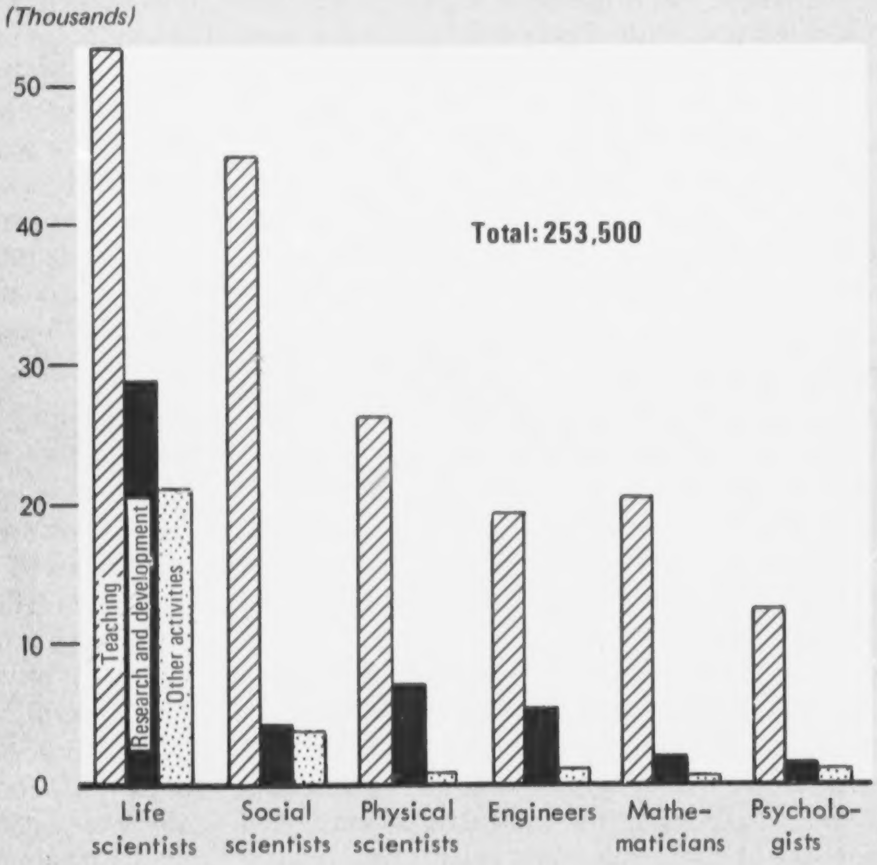
The distribution of scientists and engineers in universities and colleges by field of employment reflects the heavy orientation of their scientific and engineering programs toward the life sciences (chart 4 and table 4). As mentioned previously, the Nation's 101 medical schools and the 54 State agricultural experiment stations affiliated with doctorate-granting institutions employed an estimated 66,000 scientists and engineers in 1969. Since nearly all of the faculty and other professional staff in these organizational units are engaged in teaching, research, or other activities in the life sciences, their influence on overall staffing patterns in universities and colleges is appreciable. The field distribution of the 253,500 full- and part-time scientists and engineers employed in 1969 was as follows: Life scientists, 41 percent; social scientists, 21 percent; physical scientists, 14 percent; engineers, 10 percent; mathematicians, 9 percent; psychologists, 6 percent. Details relating to employment status, function, and educational attainment that follow are shown in appendix tables B–2 through B–5.

Life scientists

Universities and colleges employed 102,800 life scientists in 1969. Of these, 77 percent were employed full time and 23 percent part time. Comparable figures for 1965 were 74 percent and 26 percent, respectively. Life scientists comprise 39 percent of the full-time and 49 percent of the part-time scientists and engineers employed in the university sector. The large number of part-time professionals (23,700), especially health-professional personnel employed in medical schools, have a significant influence on the types of employment and education characteristics of life scientists in general.

The distribution of life scientists by function in which primarily employed indicates the importance of R&D projects and community service activities in university-affiliated medical schools and agricultural experiment stations. The relative numbers of life scientists devoting their time primarily to R&D projects (28 per-

**Chart 4.
Scientists and engineers employed in universities and colleges, by field and function, January 1969.**



Source: National Science Foundation (appendix table (B-3).

TABLE 4.—*Percent distribution of scientists and engineers employed in universities and colleges, by type of institution, function in which primarily employed, and field of employment, January 1969*

Item	Total	Engineers	Physical scientists	Mathematicians	Life scientists	Psychologists	Social scientists
Number (thousands)	253.5	25.8	34.3	22.8	102.8	14.9	52.9
	Percent distribution						
Type of institution:							
Doctorate	65.6	70.6	55.9	41.8	86.3	44.1	45.6
Master's	13.1	10.1	18.8	20.3	4.8	22.2	21.3
Bachelor's	9.8	5.4	13.0	15.0	4.2	15.0	17.0
No science degree	11.5	13.9	12.4	22.8	4.7	18.6	16.1
Function:							
Teaching	69.6	75.6	76.8	90.0	51.3	83.0	85.0
Research and development	19.2	20.4	21.0	7.8	28.0	9.5	7.9
Other activities	11.2	4.0	2.3	2.2	20.6	7.5	7.2

cent) and other science activities (21 percent), respectively, were higher than in any other field. Consequently, the percentage of scientists primarily engaged in teaching (51 percent) was lower than in any of the other fields of employment.

The educational attainment level of scientists and engineers was highest within the life sciences when doctorate degrees of all types were considered. The educational attainment level of life scientists in 1969 was distributed as follows: 43 percent held M.D.'s or other health-professional doctorates, 31 percent attained the Ph. D. level, 15 percent held master's degrees, and the remaining 11 percent, a bachelor's or the equivalent.

Social scientists

The employment of social scientists increased steadily from 32,600 in 1965 to 52,900 in 1969, an average annual increase of 12.8 percent. This was the highest growth rate exhibited in any field of employment except for mathematicians. Over the same 4-year period, the ratio of full-time to part-time social scientists remained relatively constant at 4 to 1.

Most social scientists (85 percent) were primarily engaged in teaching, another 8 percent worked on R&D projects, and the remaining 7 percent were primarily engaged in other activities. Doctorate-granting institutions employed 95 percent of the 4,200 social scientists working on R&D projects. Institutions granting degrees below the doctorate level employed virtually all of their social scientists as teachers.

In terms of educational attainment, 48 percent of the social scientists held Ph. D. degrees, and 45 percent, master's degrees. Social scientists with bachelor's degrees or the equivalent accounted for an additional 7 percent and less than 1 percent held an M.D. or other health-professional doctorate.

Nearly one-half (46 percent) of the social scientists were employed by doctorate-granting institutions. Institutions granting master's degrees ranked second with 21 percent, followed by bachelor's-granting institutions (17 percent) and institutions not granting science degrees (16 percent).

Physical scientists

The third largest employment category was the 34,300 physical scientists, of whom 88 percent were employed full time. Physical scientists ranked second to life scientists in terms of the relative number primarily engaged in research and development (21 percent.).

In terms of the relative number with Ph. D. degrees, physical scientists ranked first among the disciplinary fields, with 63 percent. The proportion of physical scientists with such degrees ranged from 75 percent of the total in doctorate-granting institutions to 14 percent in institutions not granting science degrees.

The majority of physical scientists (56 percent) were employed by doctorate-degree-granting institutions. The proportions of the total in the other institutional types were: Master's-granting, 19 percent; bachelor's-granting, 13 percent; and institutions not granting science degrees, 12 percent.

Engineers

The employment of engineers in universities and colleges totaled 25,800 in 1969. Of these, 83 percent were employed full time and 17 percent part time. The functional distribution of engineers was the following: Teaching, 76 percent; research and development, 20 percent; and other activities, 4 percent. Virtually all (97 percent) of the engineers primarily engaged in research and development were employed by doctorate-granting institutions.

The level of educational attainment of engineers varied greatly among institutional types. In doctorate-granting institutions, 56 percent of the engineers held doctorate degrees, compared with only 4 percent of the engineers employed in institutions not granting science degrees.

The employment of engineers was concentrated in doctorate-degree-granting institutions, with 71 percent. Institutions not granting science degrees ranked next with 14 percent, followed by 10 percent in master's-granting and 5 percent in bachelor's-granting institutions. The high proportion of engineers employed in institutions not granting science degrees results from the large numbers of such personnel employed in 2-year technical institutes.

Mathematicians

Between 1965 and 1969, the number of mathematicians employed increased from 13,600 to 22,800. The 13.8-percent annual rate of increase in this field exceeded that of any major field of employment during the 4-year period. During this period, the ratio of full-time to part-time scientists remained constant at 4 to 1.

The proportion of mathematicians primarily engaged in teaching (90 percent) was also the highest of any scientific field. Only 8 percent of the mathematicians were primarily working on R&D projects and 2 percent were in other activities.

Mathematicians were less heavily concentrated in doctorate-granting institutions than were the professional staffs of other major fields. The employment of mathematicians was distributed among institutional types as follows: Doctorate-granting institutions, 42 percent; institutions not granting science degrees, 23 percent; master's-granting institutions, 20 percent; and bachelor's-granting institutions, 15 percent.

Psychologists

Clinical and social psychologists comprised 6 percent of the total number of scientists and engineers. Of the 14,900 psychologists, 78 percent were employed full time. Teaching was the primary activity of 83 percent of the psychologists, R&D activities ranked next with 10 percent, and the remaining 7 percent were primarily engaged in other activities. Doctorate-granting institutions employed 44 percent of all psychologists, with the distribution among other institutional types ranging from 15 to 22 percent. In terms of educational attainment, most psychologists (61 percent) held Ph. D. degrees.

Geographic Distribution

The employment of scientists and engineers in universities and colleges is heavily concentrated in the highly urbanized Middle Atlantic and East North Central divisions (chart 5). During each of the years, 1965, 1967, and 1969, the proportion of scientists and engineers in these two divisions remained constant at 39 percent of the national total employed in institutions of higher education (appendix table B-6). Two of the Middle Atlantic States, New York and Pennsylvania, together accounted for 18 percent of the total. Similarly, in the East North Central division, Illinois and Ohio together accounted for 10 percent of the total in universities and colleges.

From 1965 to 1969, institutions in the West South Central division increased their employment of scientists and engineers at an annual rate of 9.3 percent. Texas was the principal contributor to this growth with an annual increase of 11.3 percent. The South Atlantic division was a close second in terms of increased employment of scientists and engineers, with a 9.2-percent annual rate during the 4-year period. The East North Central and West North

Central divisions were the other two divisions in which the annual rate of increase during 1965–69 period was higher than the national average of 7.7 percent.

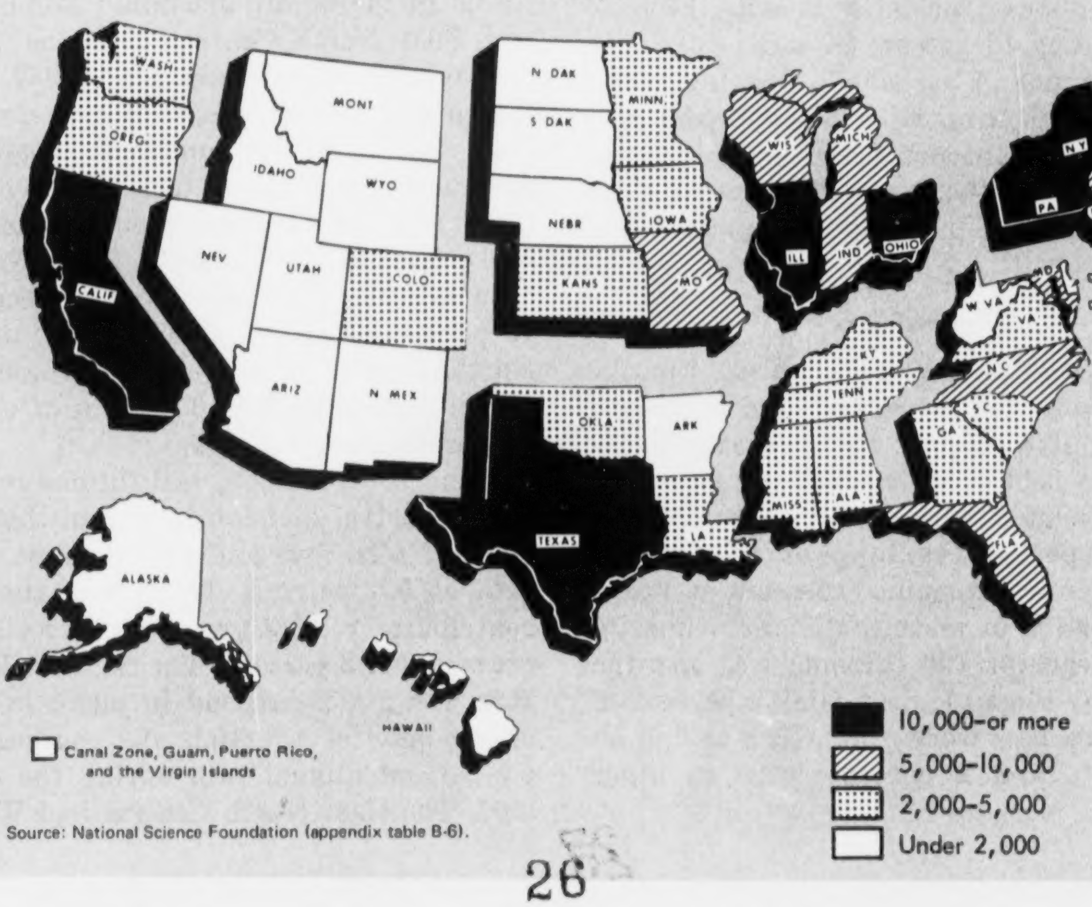
New York and California again rank first and second when the employment of scientists and engineers are analyzed by field of employment. Together, these States accounted for one-fifth of the number of scientists and engineers employed in each major field (appendix table B–7). New York ranked first in the employment of life scientists, psychologists, physical scientists, and mathematicians; California employed the largest share of engineers and social scientists.

The distribution of scientists and engineers, by level of educational attainment and geographic division, points out marked differences in the staffing patterns among universities and colleges throughout the Nation. The Mountain States had the highest proportion of their scientists and engineers holding Ph. D.'s, with 51 percent. The Middle Atlantic division, however, employed the most Ph. D.'s (21,000), but these scientists comprised only 40 percent of the division total, since M.D.'s or other health-professional doctorates accounted for an additional 26 percent (appendix table B–8). The outlying areas had the largest proportion of scientists and engineers with highest earned degrees below the doctorate level, with master's degrees accounting for 41 percent and bachelor's degrees or the equivalent, 20 percent.

The functional distribution of scientists and engineers varied considerably among the various geographic divisions (appendix table B–9). The proportion of total FTE's engaged in teaching was lowest (57 percent) in the Mountain division and highest (71 percent) in the Pacific division. Similarly, the relative number employed in research and development ranged from 17 percent of the total in the East South Central division to 30 percent in New England and 38 percent in the outlying areas. The proportion of FTE scientists and engineers engaged in other activities varied from 3 percent in the outlying areas to 18 percent in the West South Central division.

Chart 5. Geographic distribution of scientists and engineers employed in universities and colleges, January 1969.

Total: 253,500


WASH
OREG
CALIF
MONT
IDAHO
WYO
NEV
UTAH
COLO
ARIZ
N MEX
N DAK
S DAK
NEBR
KANS
MINN
IOWA
MO
OKLA
ARK
TEXAS
LA
WIS
MICH
ILL
IND
OHIO
KY
TENN
MISS
ALA
GA
S C
N C
VA
W VA
MD
DEL
D C
FLA
PA
NY
NJ
Conn
R I
MASS
VT
N H
MAINE
ALASKA
HAWAII
☐ Canal Zone, Guam, Puerto Rico, and the Virgin Islands
■ 10,000-or more
▨ 5,000-10,000
▦ 2,000-5,000
☐ Under 2,000

Source: National Science Foundation (appendix table B-6).

SECTION 2. Graduate Students Receiving Stipends for Part-Time Services as Scientists and Engineers

GRADUATE STUDENT STATISTICS presented in this report cover those students who devote part of their time to a course of study designed to lead to an advanced degree and who also receive compensation from the institutions in which they are enrolled for part-time professional services performed in the sciences or engineering. In this category are students receiving salaries or wages for their services as teaching or research assistants and students receiving duty stipends, such as scholarships, fellowships, or other awards, that require the performance of professional services in the sciences or engineering to qualify for the stipend. Excluded are graduate students receiving nonduty stipends and others who may be engaged in teaching and research activities on a voluntary basis.[11]

Graduate students included in the survey are usually classified as "junior professional staff" in personnel records of universities and colleges. By virtue of their education and training, they qualify as teaching and research assistants and for other positions at the professional level. Through a combination of work and study, graduate students enhance their professional qualifications in their disciplines and, at the same time, contribute valuable services to the institutions in which they are enrolled. However, the most important consideration for many graduate students is the fact that they are able to finance a substantial part, if not all, of their graduate education through their duty stipends.[12]

Trends, 1958–69

The number of graduate students receiving stipends for part-time services as scientists or engineers totaled 84,400 in 1969 (table 5). This represented an annual increase of 9.9 percent over the comparable 30,000 total in 1958, and an increase of 7.3 percent per year over the 73,300 total in 1967. The 84,400 graduate students receiving duty stipends comprised slightly more than one-third of total enrollment for advanced degrees in the sciences and engineering.[13]

Increases in the utilization of graduate students in teaching have overshadowed gains in their R&D activities in recent years. The number of FTE graduate students in research and development was roughly equal to the number in teaching in each of the survey years, 1958 to 1967. The FTE's in teaching increased by 4,200 between 1967 and 1969, while the FTE's in research and development increased by only 700

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[11] It should be noted that statistics on graduate students presented in this section and elsewhere in this report relate only to those compensated for professional services as scientists or engineers, and do *not* include graduate students holding nonduty stipends, such as felllowships or traineeships, that do not require the performance of professional duties as a condition for the receipt of the award. Also, where the term "graduate students" alone appears, graduate students receiving duty stipends is implied.

[12] For a description of the activities of graduate students in the sciences and engineering, see National Science Foundation, *Graduate Student Support and Manpower Resources in Graduate Science Education* (NSF 68-13) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1968).

[13] Estimated enrollment for advanced degrees in the sciences and engineering totaled 251,700 in academic year 1968–69, according to National Science Foundation, *Science and Engineering Doctorate Supply and Utilization, 1968–80, op. cit*, p. 14.

TABLE 5.—*Number of graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, and FTE graduate students, by function, selected years, 1958–69*

(Numbers in thousands)

Function	March 1958	March 1961	January 1965	January 1967	January 1969	Compound annual rate of increase 1958–69 (percent)
Number of graduate students	30.0	36.3	60.4	73.3	84.4	9.9
FTE graduate students	14.7	16.8	28.6	34.5	40.4	9.6
Teaching	6.5	7.6	14.3	16.6	20.8	11.1
Research and development	7.3	8.8	13.5	16.9	17.6	8.3
Other activities	.9	.5	.8	1.1	2.0	7.8

during the 2-year period. Between 1958 and 1969, the annual rate of increase in teaching was 11.1 percent, compared with a rate of 8.3 percent for research and development.

Doctorate-degree-granting institutions accounted for 94 percent of FTE graduate students engaged in teaching, research and development, and other science-related activities (table 6). The remaining 6 percent were enrolled at master's-granting institutions. Of the 38,100 FTE graduate students holding duty stipends at institutions granting doctorate degrees, 45 percent were engaged in research and development, compared with only 18 percent of the 2,300 FTE students at master's-degree-granting institutions.

Field

The number of graduate students in each field of science increased between 1965 and 1969 (appendix table B–10). The physical and life sciences had the largest numbers of duty-stipend holders in each of the survey years during 1965–69, but the highest annual rates of increase were recorded in the social sciences, 15.9 percent, and the psychological sciences, 13.6 percent.

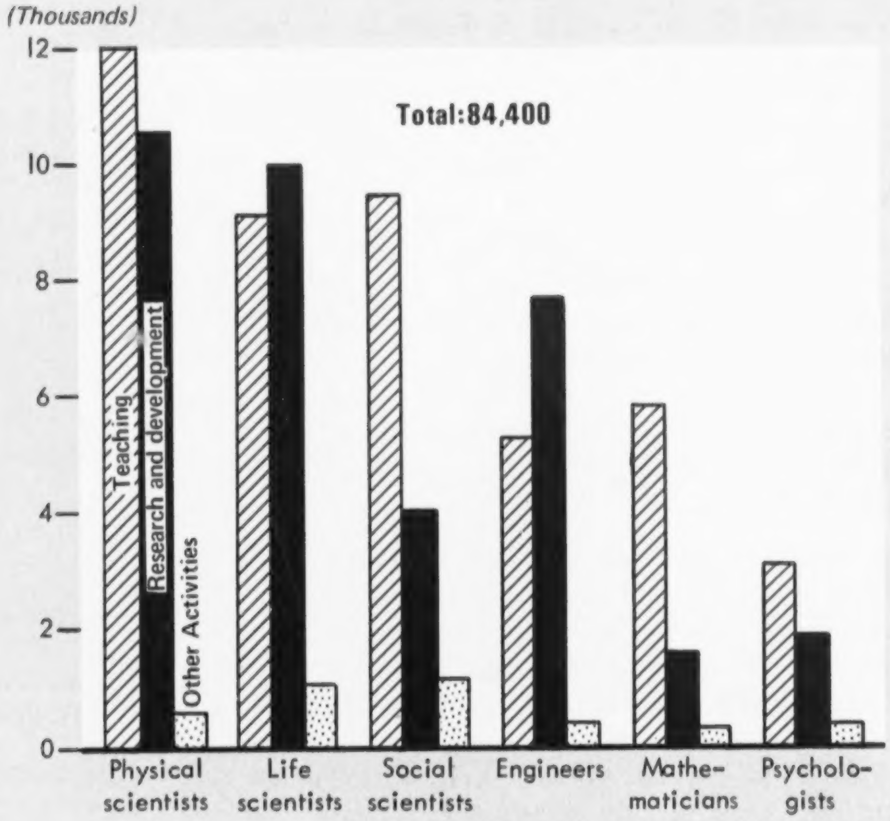
In 1969, the physical and life sciences together accounted for 43,200, or 51 percent of the total number of graduate students. The predominant physical science discipline was chemistry with 10,900 graduate students, while the biological sciences with 11,000 duty-stipend holders ranked first among the life sciences. Nine-tenths of the graduate students in each of the disciplines (except psychology) were enrolled in doctorate-degree-granting institutions (appendix table B–11).

The majority of graduate students in engineering and the life sciences were engaged primarily in research and development (chart 6). Those performing engineering research and development numbered 7,700, or 58 percent of

TABLE 6.—*FTE graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, by function and type of institution, January 1969*

Function	Number (thousands)	Percent distribution	Institutions granting—			
			Doctorate		Master's	
			Number (thousands)	Percent distribution	Number (thousands)	Percent distribution
Total	40.4	100.0	38.1	100.0	2.3	100.0
Teaching	20.8	51.4	19.1	50.2	1.7	71.0
Research and development	17.6	43.5	17.2	45.1	.4	17.5
Other activities	2.0	5.1	1.8	4.7	.3	11.6

Chart 6.
Graduate students in universities and colleges, by field and function, January 1969 [a]



[a] Graduate students receiving stipends for part-time services as scientists or engineers.

Source: National Science Foundation (appendix table B-11).

that field's total, while researchers in the life sciences totaled 9,900, or 49 percent of the total in that category. The physical sciences had the largest number of duty-stipend holders in research and development, but the 10,600 in this activity were exceeded by the number primarily engaged in teaching.

In all of the broad fields except engineering and the life sciences, the number of graduate students primarily engaged in teaching exceeded the number engaged in research and development (chart 6). The 7,700 performing research and development in engineering comprised 58 percent of the engineering total, while the 9,900 graduate student researchers in the life sciences constituted 49 percent of the total for that category. In absolute terms, however, the number of graduate students in teaching (12,000) and in research and development (10,600) in the physical sciences exceeded the comparable totals for any of the other broad fields.

Geographic Distribution

The East North Central division had the largest number of graduate students receiving stipends for part-time services as scientists or engineers in survey years 1965, 1967, and 1969 (appendix table B–12). The 20,500 duty-stipend holders in this division in 1969 comprised almost one-fourth of the national total. New York was the leading State, followed by California and Illinois.

The East North Central division accounted for more than one-fourth of the total number of duty-stipend holders in mathematics, psychology, and the social sciences, and for more than one-fifth of those involved in engineering, physical sciences, and life sciences (appendix table B–13). New York State had the largest number of graduate students receiving stipends for part-time services as scientists in the physical, life, psychological, and social sciences. Massachusetts accounted for the most duty-stipend holders in engineering, and Illinois and California, the largest number in mathematics.

The East North Central division accounted for one-fourth of the FTE graduate students engaged in teaching (5,400); one-fourth of the FTE's in research and development (4,400); and one-third of those in other activities (700), as shown in appendix table B–14. California had the largest number of FTE graduate students in teaching, while New York led in the number of FTE graduate students engaged in research and development.

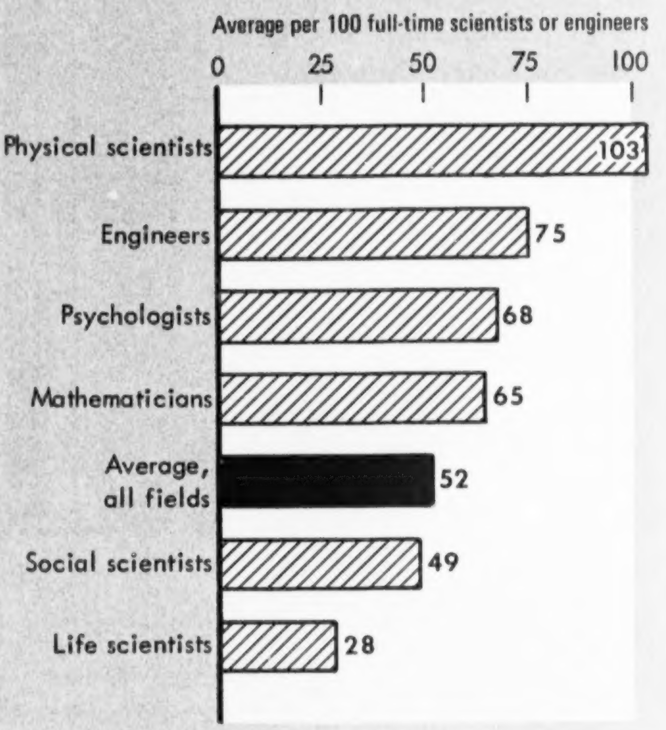
Average Number of Graduate Students With Duty Stipends Per 100 Full-Time Scientists or Engineers

Comparing the number of graduate students holding duty stipends with the number of full-time scientists or engineers provides a measure of the importance of such students in carrying out the principal functions in various fields of employment in graduate-degree-granting institutions of higher education. In 1969, these institutions averaged 52 graduate students per 100 full-time scientists or engineers (chart 7). In relative terms, more than twice as many graduate students per 100 full-time scientists or engineers were engaged in research and development (91) than in teaching (45), as shown in appendix table B–15.

The physical sciences had the highest number of graduate students (103) per 100 full-time scientists or engineers. This high ratio was mainly due to the large numbers of graduate students in chemistry. The ratio of 121 graduate students per 100 full-time scientists or engineers in chemistry was only slightly higher than the ratio of 119 per 100 in chemical engineering.

Chart 7.

Average number of graduate students per 100 full-time scientists or engineers in graduate institutions, by field, January 1969 [a]



[a] Graduate students receiving stipends for part-time services as scientists or engineers.

Source: National Science Foundation (appendix table B-15).

SECTION 3. Technicians Employed in the Sciences and Engineering

TECHNICIANS are employed by universities and colleges to assist scientists and engineers in the performance of research, teaching, and administrative functions. Technicians include all persons employed in positions that involve work at a level requiring a knowledge of engineering, mathematics, physical sciences, life sciences, psychology, or social sciences that is somewhat greater than that acquired through a high school education. This knowledge may have been obtained through formal post-high school training (less than a bachelor's degree) at technical institutes, junior colleges, military training schools, or through equivalent on-the-job training or experience. Some typical job titles include laboratory technician or assistant, engineering aid, statistical aid, draftsman, and computer programmer. Excluded from the definition of technician are craftsmen, such as electricians, carpenters, and machinists.

Number Employed

Universities and colleges employed 48,500 technicians in 1969. Virtually all of these technicians (92 percent) were employed in institutions granting doctorate degrees in the sciences or engineering. As would be expected, a high proportion of technicians (44 percent) were employed in university-affiliated or independent medical schools (table 7). Most of the technicians were engaged in R&D activities. Of the 33,800 primarily employed in research and development, 33,100 (98 percent) were at doctorate-degree-granting institutions. Almost 70 percent of all R&D technicians were engaged in some aspects of life science research.

The concentration of technician employment in the life sciences is attributable to the relatively large numbers employed in the medical school component of doctorate-degree-granting institutions (chart 8). Other types of institu-

TABLE 7.—*Percent distribution of technicians employed in the sciences and engineering in universities and colleges, by type of institution, field, and function in which primarily employed, January 1969*

Type of institution	Total	Field of employment			Function	
		Life sciences	Engineering and physical sciences	Social sciences	R&D	Other activities
Number (thousands)	48.5	33.5	12.3	2.7	33.8	14.7
	Percent distribution					
Doctorate	91.8	96.1	80.8	89.3	97.9	78.0
Medical schools	43.6	61.1	1.5	19.2	44.2	42.2
Master's	3.6	1.5	8.6	7.3	1.6	8.2
Bachelor's	1.8	1.0	4.0	1.3	.3	5.3
No science degree	2.7	1.4	6.6	2.1	.2	8.6

tions employed mostly engineering and physical science technicians (appendix table B–16).

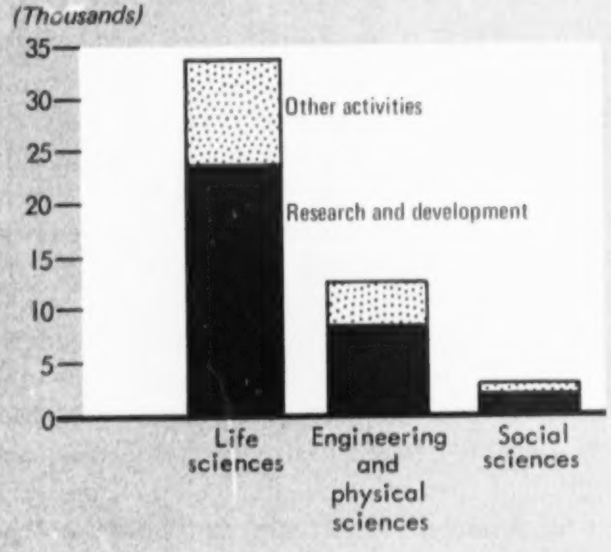
The Middle Atlantic States employed the largest number of technicians. This division accounted for more than one-fifth of total employment, as well as one-fifth of those in research and development. New York was the leading State in both respects, followed by California (appendix table B–17).

Ratio to Scientists or Engineers

Technician employment averaged 22 per 100 FTE scientists or engineers in 1969 (table 8). The ratio in doctorate institutions (30 technicians per 100 FTE scientists or engineers) which far exceeded that of other institutional types, was greatly influenced by the high ratio of 47 technicians per 100 FTE scientists or engineers in associated medical schools. In contrast, the ratio recorded by other types of institutions ranged between 4 and 6 technicians per 100 FTE scientists or engineers.

The heavy utilization of technicians in R&D performance is illustrated by the average of 66 technicians per 100 FTE scientists or engineers in that function in 1969. The comparable ratio for other activities was 9 technicians per 100 FTE scientists or engineers.

Chart 8.
Technicians employed in the sciences and engineering in universities and colleges, by field and function, January 1969.



Source: National Science Foundation (appendix table B-16).

TABLE 8.—*Number of technicians per 100 FTE scientists or engineers in universities and colleges, by function in which primarily employed and type of institution, January 1969*

Occupational group and function	Total	Institutions granting—				
		Doctorate		Master's	Bachelor's	No science degree
		Total	Medical schools			
Technicians (thousands):						
All functions, total	48.5	44.5	21.2	1.8	.9	1.3
Research and development	33.8	33.1	15.0	.6	.1	.1
Other activities	14.7	11.4	6.2	1.2	.8	1.3
FTE scientists or engineers (thousands):						
All functions, total	222.9	145.9	44.7	30.5	22.4	24.2
Research and development	51.0	48.4	15.8	1.9	.5	.1
Other activities	171.9	97.4	29.0	28.5	21.9	24.1
Number of technicians per 100 FTE scientists or engineers:						
All functions, total	21.8	30.5	47.3	5.8	3.9	5.5
Research and development	66.3	68.3	94.8	28.7	17.0	58.9
Other activities	8.5	11.7	21.4	4.2	3.6	5.2

SECTION 4. Financing of Scientific Activities

CURRENT AND CAPITAL EXPENDITURES for scientific activities in universities and colleges amounted to $7 billion in 1968, or 39 percent of estimated outlays totaling $17.9 billion for all purposes in institutions of higher education (table 9).[14] The proportion of total expenditures allocated to scientific activities in 1968 was only slightly higher than comparable figures of 38 percent in 1964 and 36 percent in 1966. The relatively small shift in the distribution of financial resources between scientific and other activities illustrates the sizable expansion characterizing all aspects of higher education in recent years. Total expenditures of universities and colleges increased at an overall rate of 14.3 percent per year from 1964 to 1968. The average annual increase of 15.1 percent in expenditures for scientific activities was only slightly higher than the 13.8-percent increase for all other activities of universities and colleges.

The $7 billion total for 1968 was distributed among the following principal activities: Current R&D expenditures, $2.6 billion; current expenditures for instruction, $3.3 billion;[15] and capital expenditures for research, development, and instruction, $1.1 billion (chart 9). The foregoing figures include both direct and indirect expenditures associated with the conduct of science and engineering programs in universities and colleges and represent universe estimates for the Nation's 2,175 universities and

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[14] Data on university-administered FFRDC's presented in part II of this report are not reflected in figures here or elsewhere in part I.

[15] Includes estimated indirect costs associated with instruction, but excludes departmental research expenditures, which are included above in current R&D expenditures.

TABLE 9.—*Current and capital expenditures for research, development, and instruction in the sciences and engineering, compared with total current and capital expenditures for all activities in universities and colleges, 1964, 1966, and 1968*

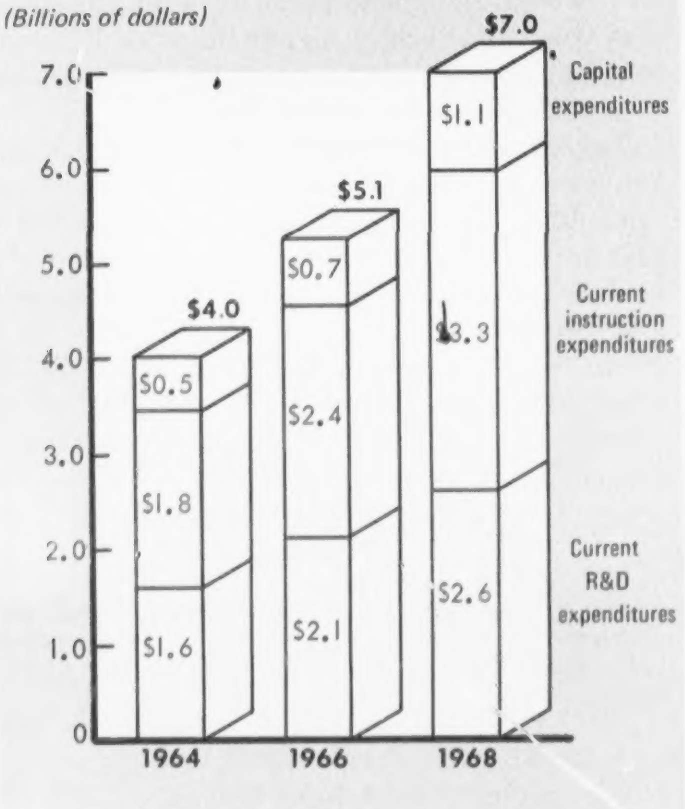
(Dollars in billions)

Year	Total [a]	Current and capital expenditures			
		Science and engineering		All other	
		Amount	Percent of total	Amount	Percent of total
1964	$10.5	$4.0	38.1	$6.5	61.9
1966	14.2	5.1	35.9	9.1	64.1
1968	17.9	7.0	39.1	10.9	60.3
Compound annual rate of increase, 1964–68 (percent)	14.3	15.1	([b])	13.8	([b])

[a] Estimates of total current and capital expenditures of universities and colleges are based on data in U.S. Office of Education, *Projections of Educational Statistics to 1977-78* (OE-10030-68) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969), p. 80. The U.S. Office of Education figures for all institutions of higher education were adjusted to exclude expenditures of university-administered FFRDC's, which are presented in part II of this report. It should also be noted that OE figures for 1966 and 1968 are estimated (*Ibid.*, pp. 92–93).

[b] Not applicable.

Chart 9.
Expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, 1964, 1966, and 1968.



Source: National Science Foundation (table 10).

colleges with such programs in 1968. The figures reflect all expenditures associated with the carrying out of scientific activities, including the science and engineering components of the following financial accounts in universities and colleges: Organized or separately budgeted research, instruction and departmental research, and plant funds. They do not include expenditures for student assistance, auxiliary activities, or other activities not directly related to the conduct of science and engineering programs.

It should be noted the $2.6 billion total for current R&D expenditures in 1968 includes an estimate of $450 million for departmental research and other R&D activities for which most universities and colleges do not maintain separate records, and separately budgeted R&D expenditures totaling $2,149 million for which institutions maintain complete records. The above estimate of $450 million for nonseparately budgeted R&D expenditures was based on statistical data supplied by respondents in the NSF's 1964 and 1966 surveys of scientific activities of higher education regarding the share of current direct expenditures for instruction and departmental research combined that was utilized for departmental research. Separate annual figures on the estimated nonseparately budgeted R&D expenditures of universities and colleges during 1953–68 are shown in appendix table B–21.

The substantial growth in overall higher education expenditures during 1964–68 also characterized the various categories of scientific activities for which separate data are available. Capital expenditures increased at an annual rate of 19.2 percent during the period, compared with annual rates of 15.7 percent for instruction expenditures and 13.0 percent for R&D expenditures (table 10).

Type of Institution

All of the institutional types registered sizable increases in expenditures for scientific activities between 1964 and 1968. The annual rates of increase during the 4-year period, by type of institution, were as follows: Doctorate, 14.8 percent; master's, 17.3 percent; bachelor's, 10.8 percent; and institutions not granting science degrees, 21.9 percent. The differing rates of growth in expenditures among institutional categories did not have consequential impacts on the distributional pattern characterizing such expenditures, because of the small outlays in institutions below the doctorate level. The share of such outlays in doctorate institutions declined from 79 percent in 1964 to 78 percent in 1968, while the proportion in institutions not granting science degrees increased from 4 percent in 1964 to 6 percent in 1968.

The dominant characteristic relating to the conduct of scientific and engineering activities in universities and colleges, regardless of geographical location or type of control, is their concentration in doctorate-granting institutions. The 220 institutions in this category

TABLE 10.—*Selected characteristics of current and capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, 1964, 1966, and 1968* [a]

(Dollars in millions)

Item	1964		1966		1968		Compound annual rate of increase, 1964–68 (percent)
	Amount	Percent distribution	Amount	Percent distribution	Amount	Percent distribution	
Total	$3,959.2	100.0	$5,129.0	100.0	$6,957.3	100.0	15.1
Type of expenditures:							
Current R&D expenditures[b]	1,594.9	40.3	2,084.7	40.6	2,598.7	37.4	13.0
Current expenditures for instruction[c]	1,834.8	46.3	2,377.3	46.4	3,287.8	47.3	15.7
Capital expenditures	529.5	13.4	667.0	13.0	1,070.7	15.4	19.2
Type of institution:							
Doctorate	3,136.2	79.2	4,084.2	79.6	5,452.9	78.4	14.8
Master's	361.6	9.1	448.2	8.7	685.0	9.8	17.3
Bachelor's	284.1	7.2	337.2	6.6	428.5	6.2	10.8
No science degree	177.3	4.5	259.3	5.1	390.9	5.6	21.9
Type of control:							
Public	2,403.5	60.7	3,172.4	61.9	4,292.5	61.7	15.6
Private	1,555.7	39.3	1,956.6	38.1	2,664.8	38.3	14.4

[a] Includes indirect costs associated with current direct expenditures for research, development, and instruction.

[b] Includes estimated expenditures for departmental research and other R&D activities for which most universities and colleges do not maintain separate records.

[c] Excludes departmental research expenditures, which are included in this table with current R&D expenditures.

accounted for 78 percent of total outlays in the 2,175 universities and colleges with science and engineering programs. As will be discussed in more detail in subsequent sections of this report, doctorate institutions accounted for 96 percent of the current R&D expenditures, 67 percent of the current instruction expenditures, and 71 percent of the capital expenditures (table 11).

Among the factors contributing to the con-

TABLE 11.—*Current and capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by type of institution and type of expenditure, 1968* [a]

(Dollars in millions)

Type of institution	Total		Current R&D expenditures [b]		Current expenditures for instruction		Capital expenditures	
	Amount	Percent distribution	Amount	Percent distribution	Amount	Percent distribution	Amount	Percent distribution
Total	$6,957.3	100.0	$2,598.7	100.0	$3,287.8	100.0	$1,070.7	100.0
Doctorate	5,452.9	78.4	2,490.7	95.8	2,202.9	67.0	759.3	70.9
Medical schools[c]	1,380.0	19.8	703.0	27.1	487.5	14.8	189.4	17.7
Master's	685.0	9.8	82.7	3.2	457.9	13.9	144.3	13.5
Bachelor's	428.5	6.2	16.8	.6	313.7	9.5	98.0	9.1
No science degree	390.9	5.6	8.5	.3	313.3	9.5	69.1	6.5

[a] Includes indirect costs associated with current direct expenditures for research, development, and instruction.

[b] Includes estimated expenditures for departmental research and other R&D activities for which most universities and colleges do not maintain separate records.

[c] Included in totals for doctorate-granting institutions.

centration of scientific and engineering activities in doctorate institutions are the relatively heavy expenditures of medical schools and agricultural experiment stations, [16] which are organizational components of doctorate-granting institutions.[17] The term "doctorate-granting institutions," as defined for survey purposes, refers to institutions granting at least one Ph. D. or M.D. degree. In addition, such institutions account annually for the majority of degrees below the doctorate level. During 1963–66, doctorate-granting institutions granted 88 percent of the master's degrees and 55 percent of the bachelor's degrees awarded in the sciences and engineering by the Nation's universities and colleges.[18] Total scientific expenditures in medical schools and agricultural experiment stations amounted to about $1.7 billion in 1968, which was one-third of the total in doctorate-granting institutions and one-fourth of the total in all universities and colleges.[19]

The concentration of expenditures for scientific activities in doctorate-granting institutions points up the key role these institutions play in the structure of higher education. To carry out research, educational, and public service responsibilities, doctorate-granting institutions must have the financial resources required to attract and retain highly qualified faculty and other professional staff and to provide and maintain facilities and equipment needed for advanced education and training. Similar observations may also be made regarding the resource needs of institutions with master's or bachelor's programs and those not granting science degrees. However, resource requirements per faculty member or per student in institutions with graduate programs are somewhat higher than in undergraduate institutions.

Field of Science

Another significant aspect of scientific expenditures in universities and colleges is their heavy orientation toward the life sciences, which accounted for 39 percent of such expenditures in 1968 (table 12). Ranking next in terms of volume of expenditures were physical and environmental sciences, 19 percent; social sciences, 15 percent; and engineering, 13 percent. The field distribution of scientific expenditures, by type of institution, indicates the influence of medical schools and agricultural experiment stations. As a consequence, expenditures

TABLE 12.—*Percent distribution of expenditures for scientific activities in universities and colleges, by field of science and type of control, 1968* [a]

Field of science	Total	Type of control	
		Public	Private
Total (millions of dollars)	$6,861.8	$4,236.5	$2,625.4
	Percent distribution		
Engineering	12.6	12.4	13.0
Physical and environmental sciences	19.2	18.5	20.2
Mathematics	6.1	6.3	5.9
Life sciences	39.1	38.8	39.6
Psychology	4.2	4.5	3.8
Social sciences	15.2	15.8	14.1
Other sciences, n.e.c.	3.6	3.7	3.3

[a] Excludes development expenditures amounting to $91.4 million, including $53.7 million in public and $37.8 million in private institutions, for which the survey did not request a field-of-science distribution.

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[16] All except 1 of the 55 agricultural experiment stations are controlled or administered by State land-grant universities and colleges. The Connecticut State Agricultural Experiment Station, located in New Haven, Conn. is controlled by the State government.

[17] For the purposes of this report, several medical schools that did not have Ph. D. programs in the basic medical or clinical sciences in 1968 and were not organizational components of institutions granting Ph. D.'s in the sciences or engineering were included in the doctorate category to facilitate uniform classification of data.

[18] National Science Foundation, *Federal Support to Universities and Colleges, Fiscal Year 1968, op. cit.*, p. 26.

[19] As indicated in section 9 of this report, medical schools expended about $1.4 billion for scientific activities in 1968. On the basis of earlier surveys in the series, it is estimated that the expenditures of agricultural experiment stations and related schools of agriculture totaled about $330 million in 1968. For information on obligations for research alone at these institutions, see U.S. Department of Agriculture, Cooperative State Research Service, *Funds for Research at State Agricultural Experiment Stations and Other State Institutions, 1968, op. cit.*

in the life sciences comprised 44 percent of the total for doctorate institutions and far exceeded the total for any other field. In contrast, expenditures in the physical and environmental sciences ranked first in master's and bachelor's institutions, and expenditures in the social sciences ranked first in institutions not granting science degrees.

Type of Control

Public universities and colleges expended $4.3 billion for scientific activities, and private institutions accounted for $2.7 billion, or 62 and 38 percent, respectively. This division in scientific expenditures coincides rather closely with certain educational characteristics. For example, of the 871,800 degrees conferred by U.S. universities and colleges in academic year 1968, public institutions conferred 61 percent and private institutions, 39 percent. Similarly, public institutions awarded 61 percent of the earned doctorates in all fields, and private institutions, 39 percent. Of the 1 million postbaccalaureate students in universities and colleges in the fall of 1968, 63 percent were enrolled in public institutions and 37 percent in private institutions.[20]

The distribution of scientific activities of public and private institutions, respectively, followed a similar pattern. The principal differentiating feature was that current R&D expenditures accounted for 41 percent of the total in private institutions, compared with 35 percent in public institutions (appendix table B–19). This was largely offset by the fact that public institutions utilized 49 percent of their scientific expenditures for instruction, compared with 44 percent for private institutions. The relative amount of capital expenditures was about the same for both public and private institutions, 16 percent and 15 percent, respectively, and was almost equally divided for each institutional category between research, development, and graduate instruction and undergraduate instruction.

The close similarity between public and private institutions was also apparent in the field-of-science allocations of their scientific expenditures (table 12). The two broad disciplinary categories in which public institutions had the largest expenditures were the life sciences (39 percent) and the physical and environmental sciences (19 percent). These two categories also ranked highest in private institutions with 40 percent and 20 percent, respectively, of total expenditures for scientific activities. The most significant difference in the field allocation of expenditures was in the social sciences, which ranked third among the broad fields for both institutional categories with 16 percent of total expenditures in public institutions and 14 percent in private institutions.

During 1964–68, total expenditures for scientific activities in public institutions increased at an annual rate of 15.6 percent, compared with 14.4 percent per year in private institutions. The rates of increase in current R&D expenditures and capital expenditures were higher in public than in private institutions. However, the relative increase in current instruction expenditures in private institutions was slightly above the comparable rate in public institutions. The rates of increase for the two institutional categories, based on data shown in appendix table B–19, are as follows:

Type of expenditure	*Annual rate of increase, 1964–68 (percent)*	
	Public institutions	*Private institutions*
Total	15.6	14.4
Current R&D expenditures	13.6	12.1
Current expenditures for instruction	15.7	15.8
Capital expenditures	20.4	17.4

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[20] U. S. Department of Health, Education, and Welfare, Office of Education, *Earned Degrees Conferred: 1967–68, Part A, Summary Data* (OE–54013–68A), p. 4 and *Opening Fall Enrollment in Higher Education: Part A, Summary Data* (OE–54003–68), p. 6. (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969).

SECTION 5. Current R&D Expenditures

Trends, 1958–68

Current expenditures for research and development[21] at universities and colleges increased from $592 million in 1958 to $2.6 billion in 1968, principally as a result of the growth of Federal sponsorship of these activities (chart 10). During this 10-year period, Federal support increased from $254 million to $1.6 billion, while support from all other sources increased from $338 million to $1 billion. As a consequence, the proportion of all R&D funds derived from Federal sources rose from 43 percent in 1958 to 60 percent in 1968.

Total R&D expenditures increased at an annual rate of 17 percent during 1958–66, and at a somewhat slower rate of 11.7 percent per year during 1966–68. The principal factor accounting for the lower annual rate in 1966–68 was a slowdown in the growth of Federal R&D financing that began in the late 1960's. Between 1958 and 1966, R&D expenditures from Federal sources increased at an average rate of 22.2 percent a year; this rate of increase dropped to 11.7 percent per year during the 1966–68 period. Preliminary information for 1969 and 1970 shows a continued leveling off in Federal R&D obligations that will result in considerably lower annual rates of growth in R&D performance than the rate for 1966–68.[22]

The bulk of R&D funds spent by universities and colleges, from both Federal and non-Federal sources, is allocated to basic research. In 1958, basic research accounted for $390 million, or 66 percent of the total; in 1968, the $2 billion spent for basic research comprised 77 percent of the total (appendix table B–22).

In terms of character of work, the growth of total R&D expenditures of universities and colleges has primarily reflected the increase in the amounts of money allocated each year to basic research, which during the 1958–66 period averaged 19.3 percent per year, and slowed to 12.1 percent per year during the 1966–68 period. Meanwhile, applied research expenditures increased at an annual rate of 10.9 percent during both 1958–66 and 1966–68, and expenditures for development increased at an average of 15.2 percent during 1958–66 and 6.3 percent during 1966–68.

R&D performance in all economic sectors

The $2.6 billion expended by institutions of

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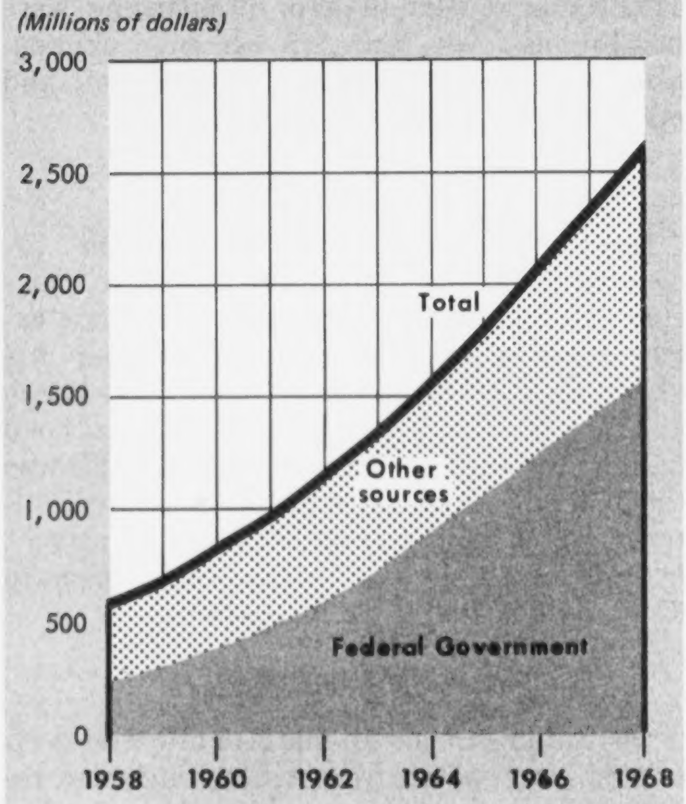
[21] The totals shown in this section for current R&D expenditures include estimated expenditures for departmental research and other R&D activities for which universities and colleges do not maintain separate records. For an explanation of these estimated expenditures, see page 18.

[22] According to the U.S. Bureau of the Budget's Special Analysis of the President's fiscal year 1971 budget, Federal R&D support at universities and colleges decreased by 2 percent between fiscal year 1969 and 1970. The 1971 budget requests a 2-percent increase over the 1970 level.

Chart 10.
Current R&D expenditures in universities and colleges, by source of funds, 1958-68.



Source: National Science Foundation (appendix table B-21).

higher education to current expenditures for research and development comprised 10 percent of the $25.3 billion total in all sectors of the economy in 1968.[23] In comparision, R&D outlays of universities and colleges amounted to only 5 percent of the total R&D expenditures of $10.9 billion in 1958. During 1958–66, the rate of increase of R&D expenditures in universities and colleges of 17 percent per year was higher than the 9.4-percent rate for the economy as a whole. This was also the case during 1966–68, when university and college R&D expenditures increased at an annual rate of 11.7 percent and R&D expenditures in all sectors of the economy increased at an annual rate of 6.6 percent.

Notwithstanding the slackened rate of increase in Federal R&D financing in the late 1960's, Federal R&D spending was the principal factor influencing the growth in research and development—including universities and colleges—during 1958–68. In 1968, the Federal Government financed 59 percent of R&D performance in all sectors of the economy, compared with 60 percent of the total in universities and colleges. In 1958, Federal R&D financing amounted to 62 percent and 43 percent, respectively.

The $2 billion expended by universities and colleges for basic research comprised more than one-half (53 percent) of the total basic research expenditures in the economy as a whole in 1968. In contrast, total applied research expenditures, and total development expenditures accounted for 9 percent, and less than 1 percent, respectively, of the economy as a whole.

Nonseparately budgeted R&D expenditures

As mentioned previously, the foregoing figures refer to all current expenditures for research and development in universities and colleges. For example, 1968 figures include both separately budgeted R&D expenditures amounting to $2.1 billion and an estimated $450 million for departmental research and other R&D activities for which universities do not maintain separate records. The latter category, which are referred to as "nonseparately budgeted R&D expenditures" for the purposes of this report, include amounts allocated to departmental research by the various academic departments, as well as indirect costs associated with R&D performance. Generally, estimated nonseparately budgeted R&D expenditures have amounted annually to about one-fifth of the total R&D expenditures in universities and colleges (appendix table B–21). The figures reported in the remainder of this section refer to separately budgeted R&D expenditures only.

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[23] National Science Foundation, *National Patterns of R&D Resources: Funds and Manpower in the United States, 1953–70* (NSF 69–30) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969), p. 27.

Separately Budgeted R&D Expenditures

The term "separately budgeted R&D expenditures" refers to funds spent on R&D projects financed by outside sponsors through contracts or grants, or allocated to a specific research project by the institution itself out of general funds. Included in such financing are the wages and salaries of faculty members, graduate students, and clerical staff; costs of expendable materials and supplies; and the overhead (indirect) costs for which the university or college has been reimbursed or is entitled to reimbursement. The total does not include capital expenditures for the purchase of durable equipment or the construction of buildings; indirect costs for which the institution is not reimbursed; or salaries of faculty or others engaged in R&D performance that are not charged to separately budgeted R&D projects.

Source of funds

As indicated previously, separately budgeted R&D expenditures include only restricted or earmarked funds used for R&D performance, and thus do not encompass "nonseparately budgeted" R&D expenditures, which are financed entirely from institutions' own funds. These differences in definition should be taken into account in interpreting statistics on separately budgeted R&D expenditures presented in the remainder of this section.

The Federal Government provided 73 percent of the funds used for separately budgeted research and development, while State governments provided an additional 10 percent (chart 11). Ranking next in level of financing were institutions' own funds (8 percent), foundations (3 percent), industry (3 percent), and other outside sponsors (3 percent).

Type of institution

Since doctorate-granting institutions accounted for 97 percent of all separately budgeted expenditures, the distribution of these expenditures by source of funds in this group was almost identical to that of all institutions (table 13). The dominant feature of the distributional pattern for each of the institutional types was the federally financed share of such expenditures, which ranged from a high of 81 percent in institutions not granting science degrees to 65 percent in bachelor's institutions.

Geographic distribution

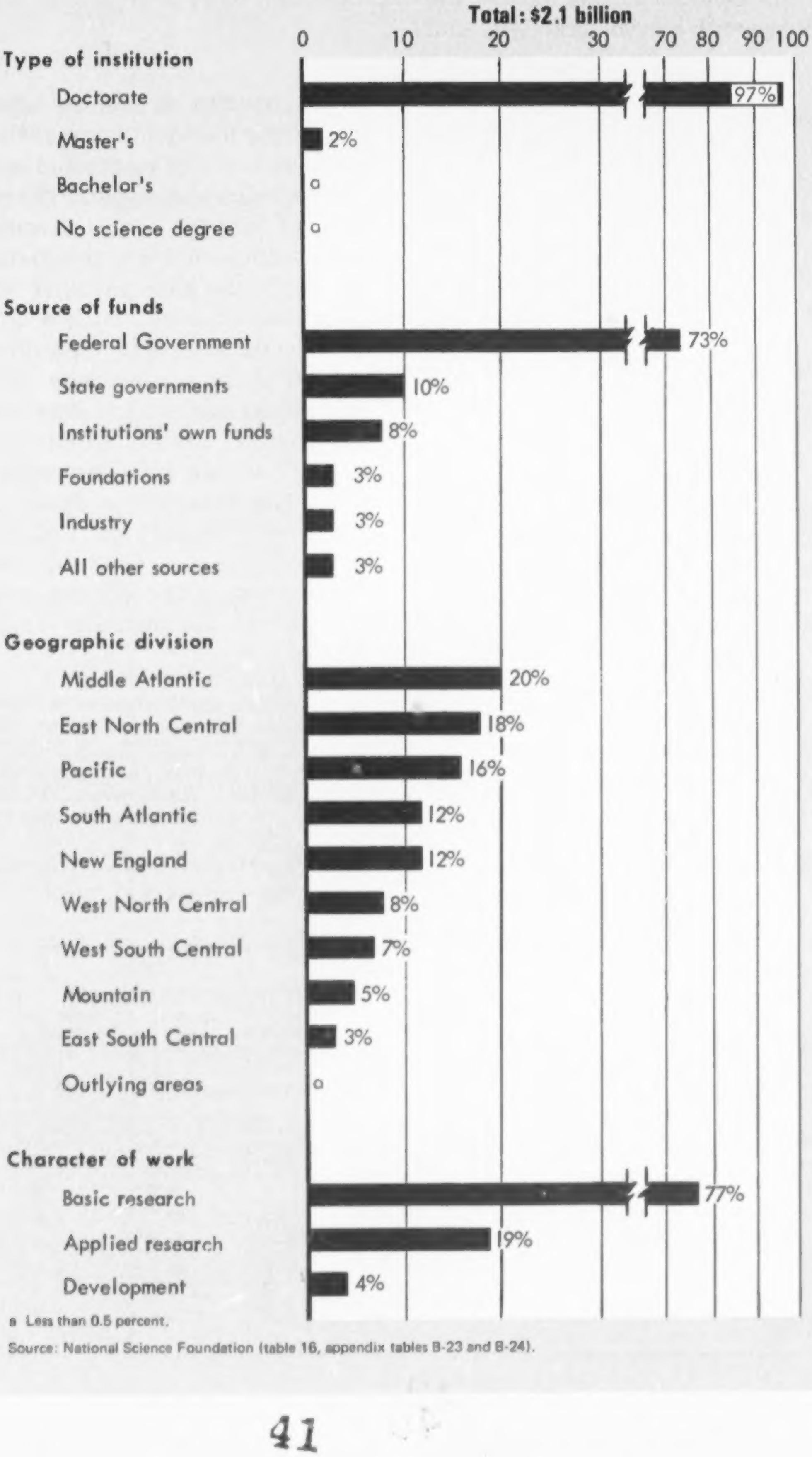
Institutions in the Middle Atlantic States allocated more money to separately budgeted re-

TABLE 13.—*Percent distribution of current expenditures for separately budgeted research and development in universities and colleges, by source of funds and type of institution,1968*

Source of funds	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total (millions of dollars)	$2,148.7	$2,092.2	$41.8	$9.5	$5.2
	Percent distribution				
Federal Government	73.2	73.2	70.4	64.5	80.6
State governments	10.0	10.1	10.2	3.2	.6
Local governments	.5	.5	.8	.2	----------
Foundations	3.3	3.2	6.3	8.7	12.2
Voluntary health agencies	1.1	1.1	.3	.1	----------
Industry	2.6	2.5	3.7	6.1	(a)
Institutions' own funds	7.7	7.6	6.9	14.2	6.3
Other sources	1.7	1.7	1.3	2.9	.3

[a] Less than 0.05 percent.

Chart 11.
Characteristics of separately budgeted R&D expenditures in universities and colleges, 1968.



a Less than 0.5 percent.

Source: National Science Foundation (table 16, appendix tables B-23 and B-24).

search and development than did those in any other geographic division. In 1968, they accounted for one-fifth of total separately budgeted R&D expenditures for all institutions in the country, while institutions in the East North Central States reported the second largest amount, 18 percent of the total (appendix table B–24).

In every geographic division, the Federal Government provided a majority of the funds used for separately budgeted R&D expenditures. The federally financed proportion was highest in the New England States (88 percent) and the Pacific States (76 percent), and lowest in the outlying areas (51 percent). Of the continental divisions, the West South Central reported the smallest relative amount of Federal support for separately budgeted R&D activities (64 percent) and was followed closely by the West North Central (65 percent).

Type of control

The Federal Government was the main source of funds for separately budgeted R&D expenditures in 1968 in both publicly controlled and privately controlled institutions, accounting for 66 percent of the total in the former group and 83 percent in the latter (table 14). In contrast, State governments furnished 17 percent of the total spent by public institutions, but only 2 percent in private institutions.

In terms of rank, State governments financed the second largest amount of public institutions' expenditures, followed by the institutions themselves, nonprofit foundations, industrial firms, and other sources, in that order. Private institutions provided the second largest amount themselves, followed by nonprofit foundations, industry, other sources, and State governments.

Major cost item

Of the $2.1 billion in separately budgeted R&D expenditures, institutions allocated 54 percent to direct wages and salaries, 33 percent to other direct costs, and the remaining 13 percent to indirect costs. In comparison with the distribution in 1964, this indicates a slight increase in the importance of wages and salaries and indirect costs, with a corresponding proportional decrease in other direct costs.[24]

The share of federally financed separately budgeted research and development allocated to other direct costs and indirect costs (34 and 15 percent of the total, respectively) was higher than the comparable figure for nonfederally financed expenditures. Conversely, 61 percent of nonfederally financed expenditures were use for wages and salaries, compared to only 51 percent of the federally financed total (table 15).

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[24] The comparable figures in 1964 were 53 percent, wages and salaries; 36 percent, other direct costs; 11 percent, indirect costs. See National Science Foundation, *Scientific Activities at Universities and Colleges, 1964* (NSF 68–22) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1968), p. 10.

TABLE 14.—*Current expenditures for separately budgeted research and development in universities and colleges, by source of funds and type of control, 1968*

(Dollars in millions)

Source of funds	Total		Public		Private	
	Amount	Percent distribution	Amount	Percent distribution	Amount	Percent distribution
Total	$2,148.7	100.0	$1,217.5	100.0	$931.2	100.0
Federal Government	1,572.1	73.2	803.5	66.0	768.5	82.5
State governments	215.1	10.0	200.9	16.5	14.2	1.5
Local governments	10.4	.5	5.0	.4	5.4	.6
Foundations	71.6	3.3	32.2	2.6	39.4	4.2
Voluntary health agencies	23.6	1.1	9.9	.8	13.8	1.5
Industry	55.3	2.6	31.4	2.6	23.8	2.6
Institutions' own funds	164.5	7.7	114.0	9.4	50.5	5.4
Other sources	36.1	1.7	20.6	1.7	15.6	1.7

TABLE 15.—*Current expenditures for separately budgeted research and development in universities and colleges, by major cost item and source of funds, 1968*

(Dollars in millions)

Cost item	Total		Federal Government		Other sources	
	Amount	Percent distribution	Amount	Percent distribution	Amount	Percent distribution
Total	$2,148.7	100.0	$1,572.1	100.0	$576.6	100.0
Direct wages and salaries	1,152.2	53.6	802.7	51.1	349.5	60.6
All other direct costs	716.5	33.3	534.7	34.0	181.7	31.5
Indirect costs reimbursed or reimbursable	280.0	13.0	234.6	14.9	45.4	7.9

Character of work

As in previous years, the largest proportion of separately budgeted R&D expenditures in 1968 was allocated to basic research (77 percent). Applied research accounted for 19 percent, and development for the remainder.

In the case of doctorate-granting institutions, the distribution of expenditures for separately budgeted research and development was virtually identical to that for all institutions in the survey. The distribution of expenditures of other institutional types showed less concentration in basic research and correspondingly more money allocated to applied research and to development (table 16).

Separately Budgeted *Research* Expenditures

Data relating to the distribution of separately budgeted expenditures by field of science were not obtained for development, but only for *basic and applied research.* As in 1964 and 1966, the largest proportion of the separately budgeted research expenditures of universities and colleges was allocated to the life sciences (table 17). The second largest amount was allocated to the physical and environmental sciences combined; and the third largest, to engineering.

Source of funds by field of science

The life sciences accounted for the largest single proportion of Federal funds (47 percent of the total). Ranking next in terms of Federal support were the physical and environmental sciences combined (24 percent); engineering (14 percent); and the social sciences (7 percent). The remaining fields, mathematics, psychology, and other sciences together, accounted

TABLE 16.—*Percent distribution of current expenditures for separately budgeted research and development in universities and colleges, by character of work and type of institution, 1968*

Character of work	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total (millions of dollars)	$2,148.7	$2,092.2	$41.8	$9.5	$5.2
	Percent distribution				
Basic research	76.9	77.3	68.8	64.6	12.6
Applied research	18.8	18.6	22.3	29.6	66.2
Development	4.3	4.1	8.9	5.8	21.1

for less than 9 percent of total Federal research financing (chart 12).

More than one-half of all nonfederally financed research expenditures were allocated to the life sciences. This reflects in large measure the heavy support of agricultural research by State governments. Ranking next in terms of non-Federal financing were the physical and environmental sciences combined (14 percent), the social sciences (12 percent), and engineering (11 percent).

The highest rate of growth over the 4-year time span occurred in the social sciences, amounting to 20 percent per year. In the two broad fields accounting for the largest expenditures, however, the life sciences and the physical and environmental sciences combined, the growth rate was lower than the 13.6-percent average per year for all fields. Expenditures for research in the physical and environmental sciences increased at an annual rate of 12.7 percent during 1964–68, while those in the life sciences increased at a rate of 10.9 percent per year (appendix table B–26).

Type of institution

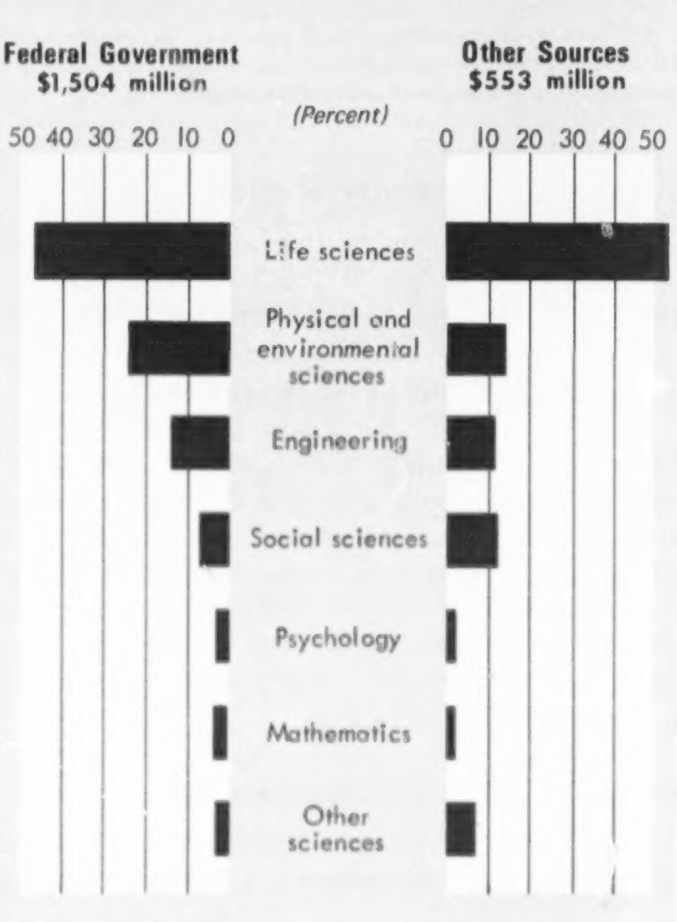
Inasmuch as doctorate-granting institutions accounted for 97 percent of total separately budgeted R&D expenditures in universities and colleges, the field distribution for the group coincided closely with the overall pattern for all institutions. In doctorate institutions the life sciences accounted for nearly one-half of total research expenditures (appendix table B–27). In contrast, both master's- and bachelor's-granting institutions allocated the largest shares of their research expenditures to the physical sciences. Institutions not granting science degrees allocated the majority of their R&D expenditures to the environmental sciences (60 percent).

TABLE 17.—*Percent distribution of current expenditures for separately budgeted research in universities and colleges, by field of science, 1964, 1966, and 1968* [a]

Field of science	1964	1966	1968
Total (millions of dollars)	$1,234.8	$1,634.4	$2,057.3
	Percent distribution		
Engineering	12.7	14.0	13.4
Physical and environmental sciences	21.5	21.1	20.8
Mathematics	2.3	2.2	2.4
Life sciences	53.5	51.4	48.6
Psychology	2.5	2.4	2.8
Social sciences	6.4	6.4	7.9
Other sciences, n.e.c	1.2	2.4	4.0

[a] Excludes development expenditures amounting to $37.6 million in 1964, $80.3 million in 1966, and $91.4 million in 1968, for which the surveys did not request a field-of-science distribution.

Chart 12.
Separately budgeted research expenditures in universities and colleges, by field of science and source of funds, 1968.



Source: National Science Foundation (appendix table B-26).

SECTION 6. Current Direct Expenditures for Instruction and Departmental Research

THE LARGEST SINGLE COMPONENT of the scientific and engineering expenditures of universities and colleges was the amount allocated to instruction and departmental research. Current direct expenditures for such purposes totaled $2.7 billion in 1968, an increase of 14.7 percent per year over the $1.6 billion reported in 1964, the first year in which the NSF survey collected data on this type of expenditure.[25] The foregoing figures do not include indirect costs associated with the operation of academic departments, which averaged 37 percent of direct costs in 1968.[26]

Current direct expenditures for instruction and departmental research, as defined for survey purposes, are the outlays covering the expenses of academic departments. They include faculty salaries, stipends for graduate assistants, clerical salaries, expendable materials and supplies used by the department, and, if the offices and classroom space of the department are housed in a separate building, utilities and maintenance costs. In the case of most academic departments, it is considered impossible or impractical for a central accounting office to determine the proper distribution of faculty salaries between teaching, research, and other activities (for example, administration or extension work). Many institutions, in fact, employ the concept of "teaching-research," indicating that a substantial amount of faculty time is spent in activities in which teaching and research are inseparably linked, and that it is expected that a faculty member will do some research to stay at the forefront of his field. Thus, the difference between "separately budgeted research" and "departmental research" is primarily one of accounting procedures relating to expenditures of restricted or earmarked funds rather than substance.

Most institutions performing separately budgeted research and development also allocate some resources to departmental research. However, many institutions with small science and engineering programs do not have the facilities, equipment, or staff to attract sponsored research projects from public or private organizations. Their limited financial resources also preclude the hiring of enough staff members to allow free time during school hours for faculty research. The contributions of such institutions to research performance may therefore amount to little more than allowing faculty members the use of facilities and equipment after hours.

Among the types of expenditures or costs associated with the performance of departmental research, the following may be cited as typical: (1) Reduction in teaching load or administrative duties for faculty members engaged in departmental research; (2) salary attributable to research grants or other separately budgeted research projects for faculty members serving as principal investigators but paid from departmental funds rather than by project sponsors; (3) compensation to eminent scholars appointed as professors, who may give some graduate seminars but primarily carry out research projects of their choice; (4) costs for exploratory research undertaken to formulate project proposals that may or may not subsequently receive support and cost reimbursement; and (5) library, secretarial assistance, materials, equipment, and other expenses incurred by a department and attributable to faculty projects, including research performed on the investigators' own time.

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[25] National Science Foundation, *Scientific Activities at Universities and Colleges, 1964, op. cit.*, p. 11.

[26] For example, $2.7 billion total for current direct expenditures for instruction and departmental research in 1968 differs from the $3.3 billion total for current direct and indirect expenditures for instruction, because the latter figure includes estimated indirect costs associated with instruction expenditures amounting to an estimated $994 million. However, it should also be noted that the $2.7 billion total includes an estimate for direct departmental research expenditures that is not included in the $3.3 billion total shown above for instruction expenditures.

One-third of all expenditures for instruction and departmental research were allocated to the life sciences (chart 13). As is the case with separately budgeted research expenditures, this reflects the predominance of the life sciences in medical and agricultural schools. Unlike separately budgeted research funds, however, the second largest amount went to the social sciences (22 percent of the total).

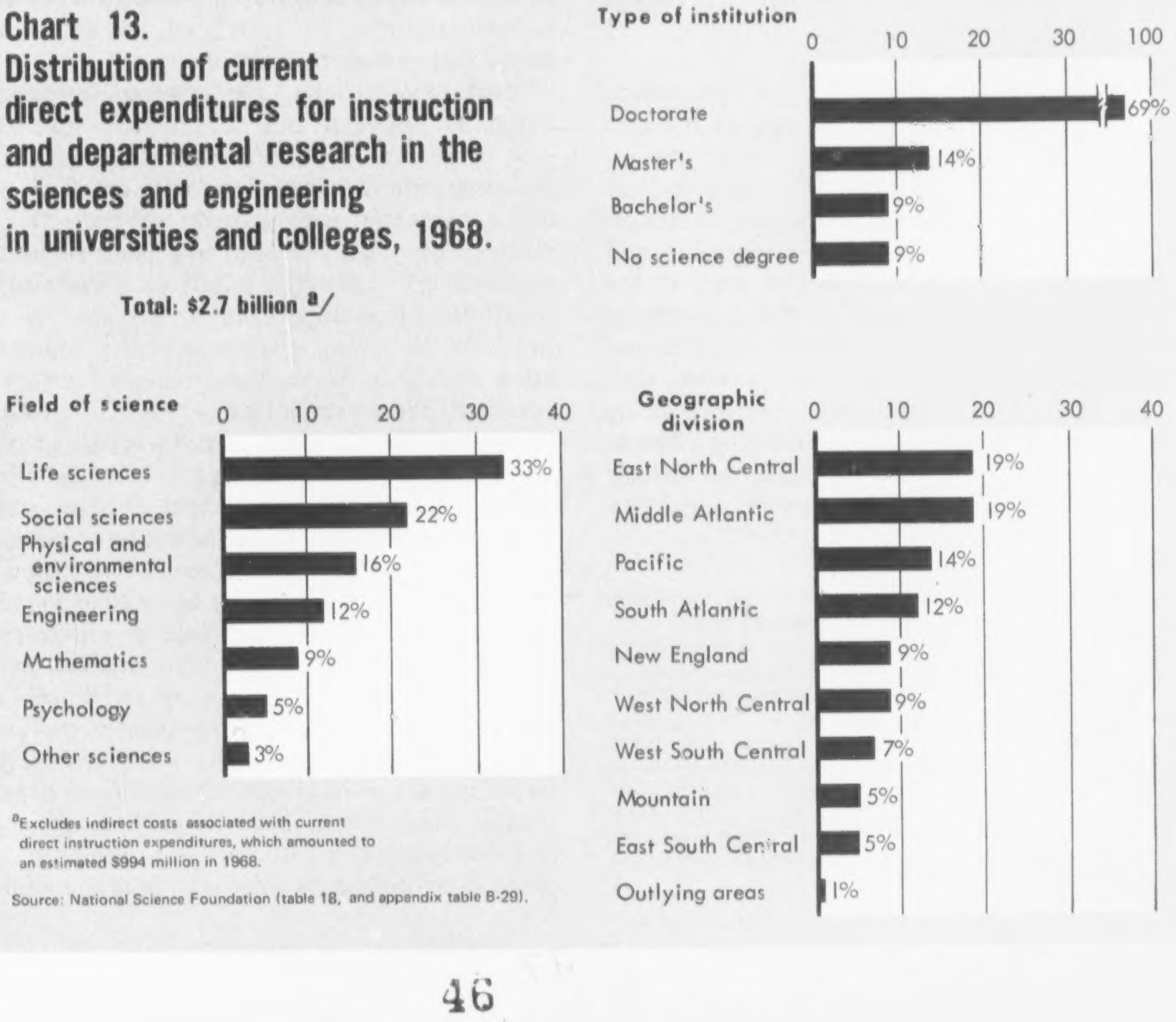
Type of Institution

Doctorate-granting institutions accounted for more than two-thirds (69 percent) of the current direct expenditures for instruction and departmental research in universities and colleges (chart 13). Such expenditures were somewhat less concentrated than either separately budgeted R&D expenditures or capital expenditures. This is attributable to the fact that virtually all surveyed institutions had some expenditures for instruction, if only salaries and equipment for one or two science teachers, while many institutions, particularly small ones, did not perform separately budgeted research and development or have capital outlays in 1968.

Though the total amounts spent for instruction and departmental research varied widely among the different types of institutions, the

Chart 13.
Distribution of current direct expenditures for instruction and departmental research in the sciences and engineering in universities and colleges, 1968.

Total: $2.7 billion [a]/



[a] Excludes indirect costs associated with current direct instruction expenditures, which amounted to an estimated $994 million in 1968.

Source: National Science Foundation (table 18, and appendix table B-29).

TABLE 18.—*Percent distribution of current direct expenditures for instruction and departmental research in the sciences and engineering in universities and colleges, by field of science and type of institution, 1968*[a]

Field of science	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total (millions of dollars)	$2,688.1	$1,848.9	$378.0	$229.2	$232.1
	Percent distribution				
Engineering	12.4	13.6	9.0	5.2	15.6
Physical and environmental sciences	16.1	14.3	20.8	21.2	17.4
Mathematics	8.5	6.3	12.2	12.9	16.0
Life sciences	32.6	39.4	15.9	19.4	18.9
Psychology	5.4	3.9	8.9	8.7	7.6
Social sciences	21.7	18.9	28.9	30.8	23.4
Other sciences, n.e.c.	3.3	3.5	4.2	1.7	1.2

[a] Excludes indirect costs associated with current direct instruction expenditures, which amounted to an estimated $994 million in 1968.

relative amounts allocated to the various disciplines followed similar patterns. Doctorate-granting institutions utilized a larger proportion of their instruction and departmental research funds in the life sciences (two-fifths of their total) than did other types of institutions (table 18 and appendix table B–28). On the other hand, the proportion of such funds allocated to the social sciences was highest in institutions below the doctorate level.

Geographic Distribution

The distribution of instruction and departmental research expenditures followed a pattern quite similar to that of professional employment in the sciences and engineering, with the largest amounts being spent in the Middle Atlantic and East North Central divisions (19 percent each) and the smallest in the East South Central and Mountain divisions (5 percent each), with the outlying areas accounting for only 1 percent. This coincides with the distribution of separately budgeted R&D expenditures, where the largest amounts were also in the Middle Atlantic and East North Central divisions.

Variations in field distribution among the continental divisions were comparatively minor, with the life sciences accounting for the largest share in each division (appendix table B–29). The East South Central division allocated relatively more funds to the life sciences (42 percent) than any of the other continental divisions; and the lowest proportion to the social sciences (19 percent). The proportion for the social sciences was highest (21 percent) in the East North Central.

SECTION 7. Capital Expenditures for Scientific and Engineering Facilities and Equipment

THE EXPANSION in enrollments in the sciences and engineering and the scale and complexity of scientific activities during the past decade has resulted in greatly increased outlays for facilities and equipment by institutions of higher education. Capital expenditures for such activities in universities and colleges totaled $1.1 billion in 1968 with doctorate-granting institutions accounting for 71 percent (table 19 and chart 14).

Included in the definition of capital expenditures used in the survey on which this report is based were: Fixed (built-in) equipment, movable scientific apparatus, movable furnishings, architects' fees and site work, and special facilities to house scientific apparatus.[27] Outside the scope of the survey were facilities not used principally for research, development, and instruction in the sciences and engineering, such as administrative buildings, heating plants and other utilities, and residence halls.

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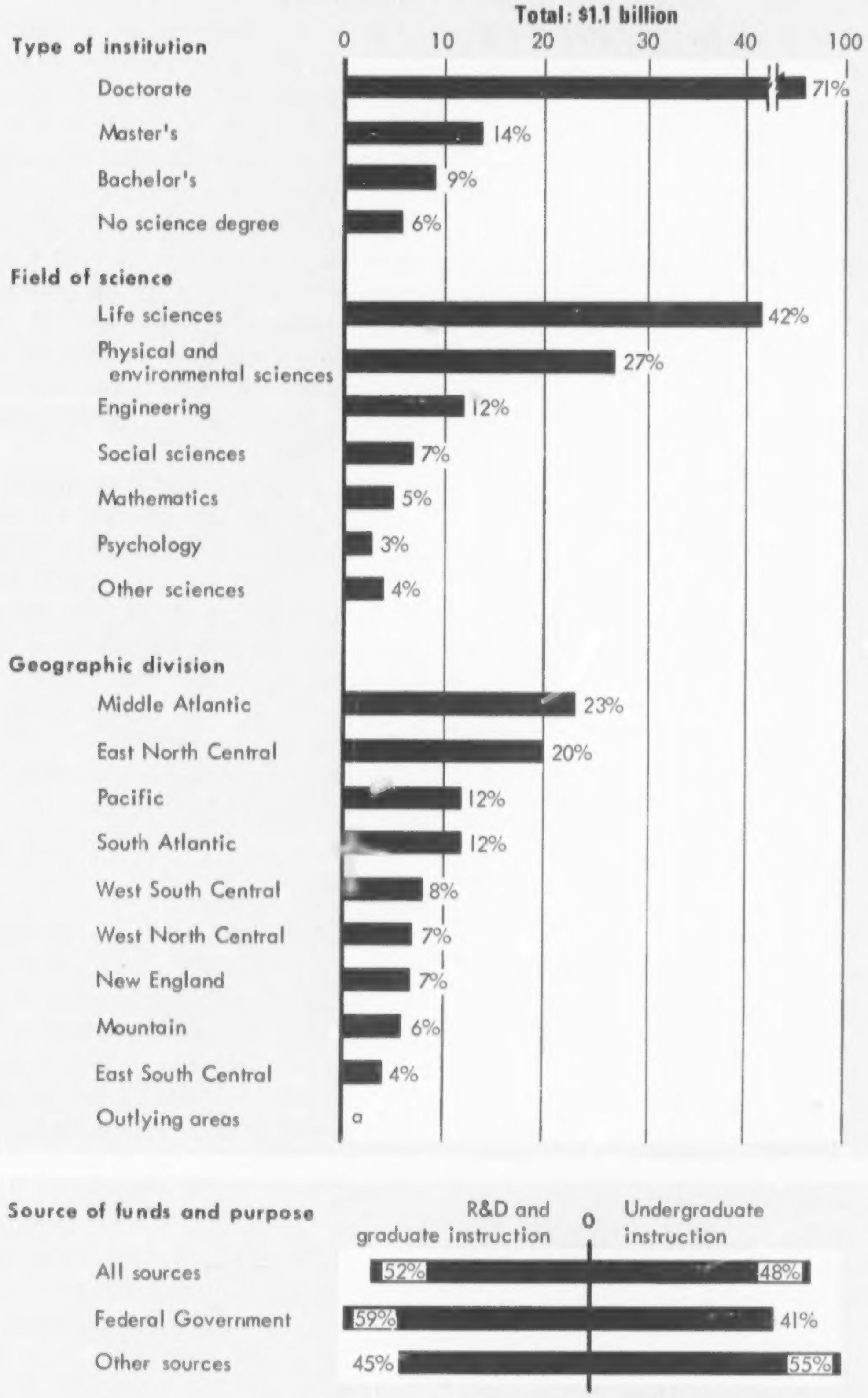
[27] See survey instructions in appendix E for specific examples of capital expenditures for science and engineering covered by the 1968 survey.

TABLE 19.—*Percent distribution of capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by purpose, source of funds, and type of institution, 1968*

Purpose and source of funds	Total (millions of dollars)	Total	Institutions granting—			
			Doctorate	Master's	Bachelor's	No science degree
		Percent distribution				
All purposes, total	$1,070.7	100.0	70.9	13.5	9.1	6.5
Federal Government	340.4	100.0	77.4	10.4	7.3	5.0
Other sources	730.3	100.0	67.9	14.9	10.0	7.2
Research, development, and graduate instruction	528.1	100.0	89.7	8.7	1.6	.1
Federal Government	202.0	100.0	93.7	5.5	.7	(a)
Other sources	326.1	100.0	87.2	10.7	2.1	.1
Undergraduate instruction	542.6	100.0	52.7	18.1	16.5	12.7
Federal Government	138.4	100.0	53.5	17.4	17.0	12.1
Other sources	404.2	100.0	52.4	18.4	16.4	12.9

[a] Less than 0.05 percent.

Chart 14.
Characteristics of capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, 1968.



[a] Less than 0.5 percent.

Source: National Science Foundation (appendix tables B-30, B-31, and B-33).

Providing requested information on various characteristics of their capital expenditures in the sciences and engineering, such as source of financing, field of science, and purpose, presented some reporting problems for survey respondents. Although the source of financing was usually clear from institutional accounting procedures, this was often not the case for other characteristics of such expenditures, such as field of science and purpose. For example, multipurpose facilities are frequently used for both undergraduate and graduate instruction and for research in several different scientific disciplines. In reporting data on multipurpose facilities, respondents were asked to prorate expenditures according to anticipated uses of such facilities.

Source of Funds

Universities and colleges rely principally upon their own resources for the financing of facilities and equipment in the sciences and engineering. However, the Federal share of such financing increased greatly during 1964–68 in both absolute and relative terms. During the 4-year span, federally financed capital expenditures more than doubled, while non-Federal expenditures increased 85 percent (table 19). The proportion of total capital expenditures financed by the Federal Government increased from 25 percent in 1964 to 38 percent in both 1966 and 1968.

Geographic Distribution

The geographical areas with large capital expenditures for research, development, and instruction in the sciences and engineering were generally the same as those with large current expenditures for these purposes. Institutions in the Middle Atlantic division reported total capital expenditures of $250 million in 1968, or 23 percent of the nationwide total; those in the East North Central division reported the second largest amount, $210 million, or 20 percent of the total (appendix table B–31).

There were wide variations among geographic divisions in the growth of capital expenditures between 1964 and 1968. While capital expenditures in the Pacific division increased by slightly more than a quarter during the 4-year period, expenditures in the Mountain division more than tripled (the largest increase in any continental division), and those in the outlying areas almost quadrupled (appendix table B–32).

In every geographic division except New England and East South Central, the amounts provided by the Federal Government increased at a faster rate than those from non-Federal sources during 1964–68. Federally financed capital expenditures increased by a factor of 3.6 in the Mountain division and by 3.5 in the South Atlantic and the West South Central divisions, but increased by only 31 percent in the East South Central division and 42 percent in New England. Capital expenditures from non-Federal sources in these latter two divisions, meanwhile, increased 77 percent and 107 percent, respectively.

The proportion of total capital expenditures sponsored by the Federal Government varied from a high of 44 percent in the outlying areas to a low of 23 percent in the East South Central division in 1968. In general, federally financed portions tended to be higher than average in the West and lower than average in the East and South, although the institutions in the South Atlantic division reported that the Federal Government financed 34 percent of their capital expenditures.

Purpose

The institutions in the survey reported that 49 percent of their total capital expenditures in the sciences and engineering were allocated to facilities and equipment for research, development, and graduate instruction (table 20). By comparison, in 1964 facilities for research, development, and graduate instruction accounted for 55 percent of the total, and in 1966, for 53 percent.

The increase in capital expenditures for undergraduate instruction came primarily from the Federal Government. Such expenditures for facilities increased more than fivefold between 1964 and 1968, while federally financed capital expenditures for research, development, and graduate instruction nearly doubled.

TABLE 20.—*Capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by source of funds and purpose, 1964, 1966, and 1968*

(Dollars in millions)

Year and source of funds	Total	R&D and graduate instruction		Undergraduate instruction	
		Amount	Percent of total	Amount	Percent of total
1964	$529.5	$289.0	54.6	$240.5	45.4
Federal Government	134.4	108.1	80.4	26.3	19.6
Other sources	395.1	180.9	45.8	214.2	54.2
1966	667.0	354.7	53.2	312.3	46.8
Federal Government	212.4	144.5	68.0	67.9	32.0
Other sources	454.6	210.3	46.3	244.3	53.7
1968	1,070.7	528.1	49.3	542.6	50.7
Federal Government	340.4	202.0	59.3	138.4	40.7
Other sources	730.3	326.1	44.7	404.2	55.3

Field of Science

The distribution of capital expenditures by broad field of science was similar to that of current expenditures. The life sciences accounted for more than any other field (42 percent of the total), with the second largest amount allocated to the physical and environmental sciences (27 percent of the total).

Though precise comparisions of distributions by field of science over the period covered by

TABLE 21.—*Percent distribution of capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by field of science and type of institution, 1968*

Field of science	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total (millions of dollars)	$1,070.7	$759.3	$144.3	$98.0	$69.1
	Percent distribution				
Engineering	11.8	10.9	8.1	16.6	22.9
Physical and environmental sciences	26.5	23.7	36.9	36.2	21.4
Mathematics	5.1	4.5	5.8	5.3	10.3
Life sciences	42.3	48.0	26.3	32.1	27.3
Psychology	3.2	1.6	12.9	1.9	2.5
Social sciences	7.1	6.9	7.2	5.0	12.0
Other sciences, n.e.c.	3.9	4.3	2.7	2.8	3.6

the survey cannot be made because of definitional changes, some broad comparisons for major categories can be made. For instance, the life sciences accounted for 44 percent of the 1964 total, as compared to 42 percent in 1968; engineering, for 14 percent in 1964 as compared to 12 percent in 1968; and the social sciences, for 6 percent in 1964 and 7 percent in 1968. Of the fields not reported separately in the earlier surveys, the physical and mathematical sciences combined accounted for 29 percent in 1964, while the physical, environmental, and mathematical sciences received 32 percent of the 1968 total; psychology and other sciences received 7 percent of the total in both 1964 and 1968.

Capital expenditures of doctorate-granting institutions, like the current expenditures of these same institutions, tended to be concentrated in the life sciences (48 percent of the total), again primarily reflecting the influence of their medical and agricultural units (table 21). In master's and bachelor's institutions, the largest shares of such expenditures were in the physical and environmental sciences, with the life sciences ranked second. The capital expenditures of institutions not granting science degrees were more widely dispersed among field categories than in the other institutional categories. The principal field allocations for these institutions were the life sciences (27 percent), engineering (23 percent), and the physical and environmental sciences (21 percent).

Institutions granting the master's and bachelor's degrees reported the largest amounts of capital expenditures in the physical and environmental sciences. This broad field accounted for 37 percent of the capital expenditures of the former group of institutions and 36 percent of those of the latter group, with the life sciences in both cases dropping to second place (26 percent and 32 percent, respectively). The physical and environmental sciences, on the other hand, accounted for the second largest portion of doctorate-granting institutions' capital expenditures (24 percent) and the third largest (21 percent) in the case of institutions not granting science degrees.

SECTION 8. Manpower and Financial Resources Compared with Selected Educational Characteristics

THE PRECEDING SECTIONS of this report have indicated that the employment of scientists and engineers, R&D expenditures, and the other characteristics of scientific and engineering activities in universities and colleges tend to be concentrated in doctorate-granting institutions and in certain geographic areas. The purpose of this section is to examine interrelationships between various financial and employment measures of scientific activities and the educational characteristics of selected groups of universities and colleges, as reflected in numbers and types of degrees granted.

During the academic year 1966–67, universities and colleges in the United States granted 253,600 degrees in the sciences and engineering, of which 12,800 were Ph. D.'s. The distribution of these degrees corresponded rather

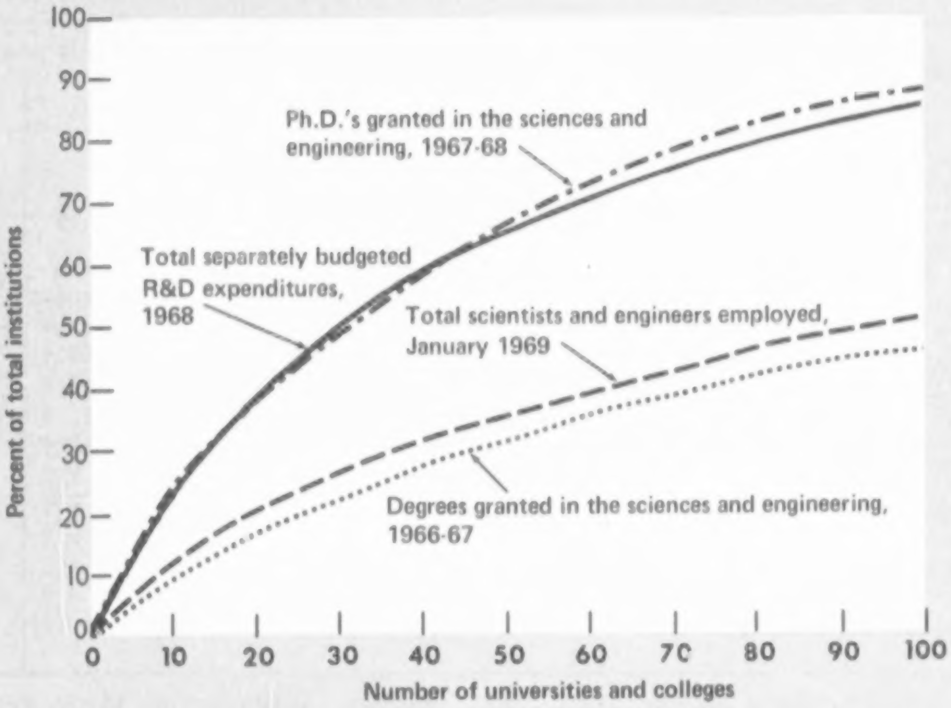


Chart 15.
Cumulative percent distribution of selected characteristics of 100 institutions with the largest separately budgeted R&D expenditures in 1968.

Source: National Science Foundation (appendix table B-34).

closely to the distribution of scientific and engineering expenditures, as well as to the employment of scientists and engineers, whether the institutions were ranked on the basis of their total separately budgeted R&D expenditures or arrayed geographically.

Institutions Ranked by Total Separately Budgeted R&D Expenditures

As has already been shown in the sections dealing with each of the different parameters of scientific activities, both manpower and expenditures in the sciences and engineering were concentrated in institutions granting doctorate degrees. Within the doctorate category, as well as in other institutional groups, there is considerable variation among institutions in the size of their science and engineering programs. When all institutions are ranked on the basis of their total separately budgeted expenditures for research and development, it is seen that the 10 institutions with the largest expenditures for research and development accounted for 25 percent of the total R&D expenditures of all universities and colleges, 27 percent of the federally financed R&D expenditures, 11 percent of the current expenditures for instruction and departmental research, and 9 percent of the total capital expenditures (appendix table B–34). These same institutions employed 12 percent of the scientists and engineers in all universities and colleges and granted 26 percent of the Ph. D.'s and 9 percent of all degrees. Altogether, the 100 institutions with the highest current expenditures for separately budgeted research and development accounted for 86 percent of the separately budgeted R&D expenditures, both total and federally financed, 51 percent of the expenditures for instruction and departmental research and capital expenditures, and employed 51 percent of the scientists and engineers (chart 15). These 100 institutions granted 88 percent of the Ph. D. degrees and 46 percent of all degrees in the sciences and engineering.

Geographic Distribution

The same two geographic divisions in which the highest levels of scientific and engineering expenditures were reported, i.e., the Middle At-

TABLE 22.—*Percent distribution of selected employment, financial, and educational characteristics of scientific activities of universities and collegcs , by geographic division*

Geographic division	Scientists and engineers, January 1969		Scientific and engineering expenditures, 1968		Degrees granted in the sciences and engineering, 1966–67[a]			
					Total		Ph.D. or Sc.D.	
United States, total	253,500		$6,957.3 million[b]		253,600		12,800	
	Rank	Percent distribution	Rank	Percent distribution	Rank	Percent distribution	Rank	Percent distribution
Middle Atlantic	1	20.6	1	20.2	2	19.4	2	18.7
East North Central	2	18.3	2	18.4	1	19.9	1	22.0
South Atlantic	3	13.9	4	12.1	4	11.5	4	10.7
Pacific	4	12.9	3	14.5	3	13.8	3	15.7
New England	5	8.3	5	9.7	7	7.7	5	9.3
West North Central	6	8.2	6	8.2	5	9.3	6	9.0
West South Central	7	8.0	7	7.1	6	8.0	7	7.4
East South Central	8	4.7	9	4.2	8	5.2	9	2.4
Moutain	9	4.4	8	5.2	9	4.8	8	4.8
Outlying areas	10	.7	10	.5	10	.5	10	(c)

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[a] Based on statistics of the U.S. Office of Education. Excludes first-professional doctorates in medical and health-related fields (M.D., D.D.S., etc.)

[b] Percent distribution based on data which exclude the indirect costs associated with instruction and departmental research expenditures and other R&D expenditures for which universities and colleges do not maintain separate records, amounting to an estimated $1,049.7 million.

[c] Less than 0.05 percent.

lantic and the East North Central divisions, also reported the largest number of total and Ph. D. degrees awarded. However, in the case of total degrees, the order was reversed, with the East North Central ranked first by a narrow margin (20 percent of the total, compared to 19 percent in the Middle Atlantic division). A similar situation existed with regard to the divisions ranking third and fourth. The Pacific ranked third in terms of scientific and engineering expenditures, total degrees granted, and doctorates granted, and fourth in terms of scientists and engineers employed, while the South Atlantic ranked third in terms of number of scientists and engineers employed and fourth in terms of scientific and engineering expenditures, total degrees granted, and Ph. D.'s granted (table 22).

Whether ranked on the basis of total scientists and engineers employed, scientific and engineering expenditures, total degrees granted in the sciences and engineering, or scientific and engineering Ph. D.'s awarded, the continental divisions tended to fall into the same four groups, and, while there were shifts within each group, there were no changes between groups. Thus, as shown above, the first group consisted of the Middle Atlantic and East North Central divisions; the second included the South Atlantic and Pacific divisions. The same was true of the third and fourth groups, where the third comprised the New England, West North Central, and West South Central divisions, and the fourth, the East South Central and Mountain divisions. Far below the lowest of the continental groups on all measurements of science resources were the outlying areas, as has been indicated earlier.

SECTION 9. Medical Schools

THIS SECTION presents summary data on the employment and financial characteristics of the 101 medical schools that were in operation in January 1969. According to the Council on Medical Education of the American Medical Association, 89 medical schools were fully operational and accredited, while 12 were classified as "developing" and awaiting the graduation of their first classes. Previous sections of this report included data for the 101 medical schools with those for doctorate institutions, since virtually all medical schools are either organizational components of doctorate-granting institutions, or, if independent and not directly affiliated with institutions granting Ph. D.'s in the sciences, conduct Ph. D. programs in the clinical or biomedical sciences within the medical school. In academic year 1967–68, only three medical schools did not conduct Ph. D. progams and were not components of institutions with such programs. To maintain uniformity in the classification system used in this report, all medical schools were grouped together, including both medical schools with 4-year programs that had not yet graduated their first classes and medical schools that offered only 2-year programs in the basic medical sciences.

Of the 101 schools surveyed, 93 offered 4-year programs in medical and clinical sciences and 8 offered 2-year programs in the basic medical sciences. Those schools maintaining little or no affiliation with a parent institution, often referred to as "independent," will not be treated separately in this report, for their characteristics bear a close resemblance to those medical schools that are integral parts of universities. Survey responses were received from all but 12 medical schools, and for these schools estimates were prepared based on secondary sources or from previous survey responses in order to obtain universe estimates of the employment and financial characteristics of all medical schools. Included in the data are hospitals or clinics owned, operated, or controlled by universities and integrated operationally with the clinical programs of their medical schools. Also included are research bureaus or institutes that are integral parts of medical schools.

Activities of individual medical schools are integrated with those of hospitals, research institutes, and parent universities in varying degrees. All medical schools are affiliated with public or private hospitals in some degree in order to provide the requisite education, training, and research in the basic medical and clinical sciences needed by their students. Such affiliations also afford opportunities to contribute medical and health-related services to the local community. For example, 49 medical schools owned or operated 55 hospitals, less than 1 percent of the Nation's 7,172 registered hospitals in 1968.[28]

Control of medical schools has tended to shift gradually from private to public in recent years. In 1964, the 89 medical schools were almost evenly divided, with 44 public and 45 private schools; in 1968, 58 were publicly controlled and 43 were privately controlled. Among the reasons for this shift is the heavy financial commitment required by medical schools. As a consequence, several private medical schools have changed to public control in recent years, and all 12 of the medical schools in the development stage in 1969 were public institutions. Eleven of the 12 developing schools have affiliated with State-controlled institutions and the remaining one, Mt. Sinai School of Medicine, with the City University of New York.

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[28] "Hospitals," *Journal of the American Hospital Association* 42:15, part 2 (Aug. 1, 1968).

Two-thirds of the Nation's medical schools are located east of the Mississippi, with 11 in New York, 7 in Pennsylvania, and 5 in Illinois. Of the 35 located west of the Mississippi, California ranks first with 8, followed by Texas with 5. Seven States, five of which are in the West, did not have medical schools.[29]

The enrollment of 34,500 students in medical schools in academic year 1967–68 represented only a 1.9-percent annual rate of increase over the 1964 enrollment of 32,000. The need for greater enrollment in medical education is evident in this comparatively low rate of growth, but medical schools are finding it increasingly difficult to provide the necessary faculty or classrooms during this era of increased demand and inadequate funding. Similarly, the number of M.D. degrees awarded increased from 7,300 in 1964 to 8,000 in 1968, at an annual rate of only 2.1 percent. Master's degrees awarded in graduate programs in the basic medical and clinical sciences in medical schools increased from 700 in 1964 to 1,100 in 1968, at an annual rate of growth of 11.2 percent, while doctorates awarded in these programs rose from 800 to 900 during this same period, at a growth rate of only 4.1 percent.[30]

Traditionally, medical schools play a dominant role in the conduct of medical and health-related research. The Federal Government, in its efforts to improve the Nation's health care, provides support through a variety of mechanisms which have encouraged the growth of basic medical and clinical science departments and accelerated the training of health manpower. Population growth and demand for better health services place the medical schools in a central role for the conduct of programs bettering the Nation's health standards, and they find themselves increasingly pressed for services, space, and funds to meet these needs adequately.

Scientific and Technical Personnel

Scientists [31]

The Nation's 101 medical schools employed 55,100 scientists in 1969, which represented 22 percent of the total number of scientists and engineers employed in universities and colleges. Since 1965, the number employed has increased at a rate of 4.7 percent per year (appendix table C–1). It should be noted that the figures reported here represent only employed staff members; voluntary or unpaid staff were excluded from survey coverage.

As might be expected, staffing patterns in medical schools differ markedly from those in other organizational units of universities and colleges. One of the principal differentiating features is the heavy reliance of medical schools upon part-time staff to carry out their various functions. In 1969, such personnel comprised 29 percent of the total number of scientists employed in medical schools, compared with 17 percent of the total in other units of universities and colleges. It may be relevant to note that the number of part-time scientists employed in medical schools in 1969 was somewhat lower than the comparable figure (35 percent) in 1965. The relatively large number of part-time staff in medical schools reflects the practice of virtually all schools to rely upon the services of local medical practitioners. The recruitment and retention of such part-time personnel are facilitated by the fact that medical doctors and others in the community welcome the prestige and opportunities for public services associated with faculty status at local medical schools.

A change in the pattern of the conduct of scientific activities within medical schools is gradually emerging. The percentage of time devoted to teaching, on an FTE basis, has remained fairly constant since 1965, about 40 percent. Some of those engaged in research, however, appear to be shifting to other activities, which increased from 20 percent of the total in 1965 to 25 percent in 1969. Interpretation of the significance of this shift should be

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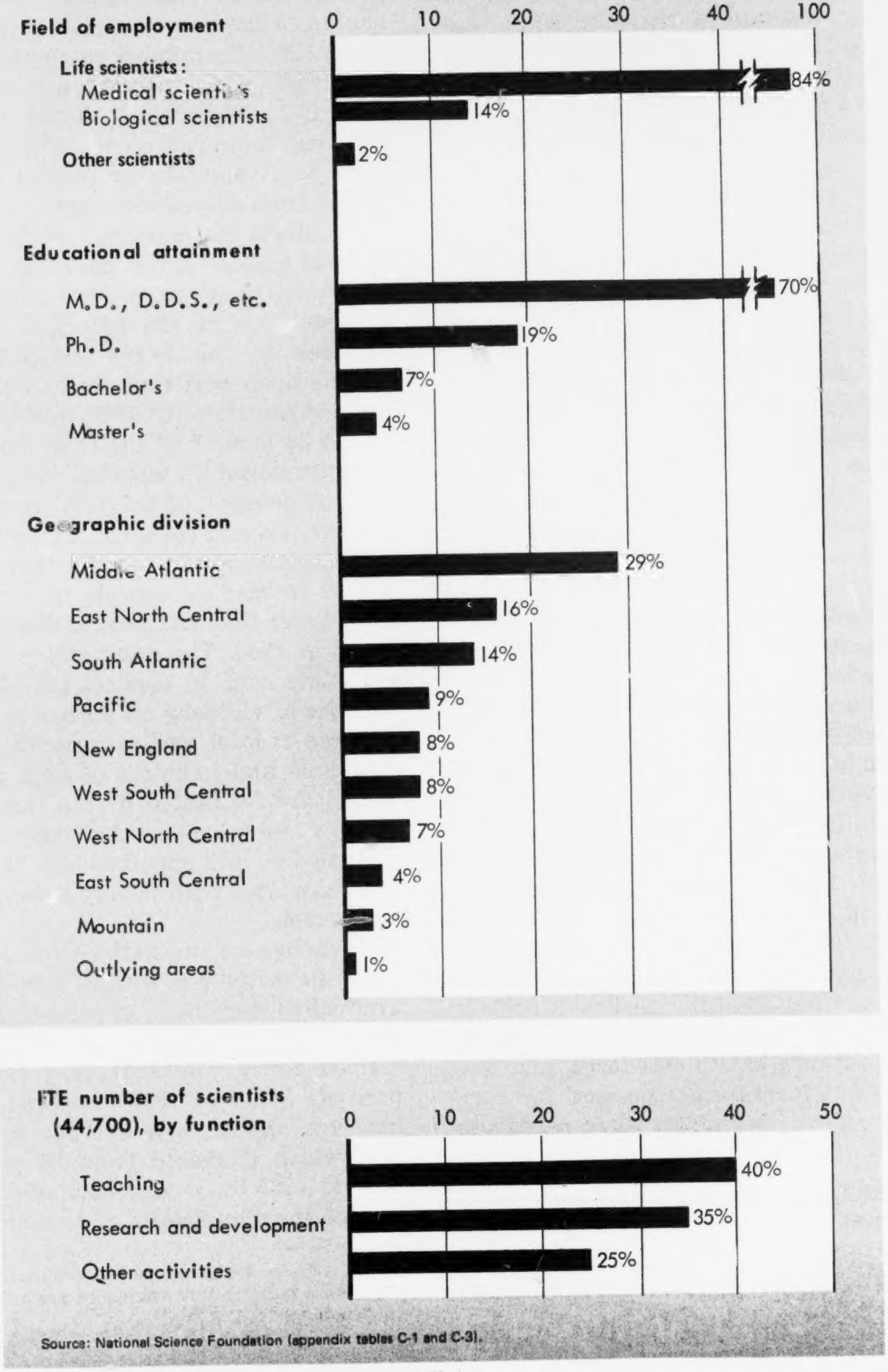
[29] States without medical schools in 1969 were: Alaska, Delaware, Idaho, Maine, Montana, Nevada, and Wyoming.

[30] "Medical Education in the United States," *Journal of the American Medical Association*. Education Numbers for 1964, 1966, and 1968.

[31] In this section, the term "scientists" will include engineers, because few engineers are employed in medical schools.

Chart 16.
Characteristics of scientists employed in medical schools, January 1969.



Source: National Science Foundation (appendix tables C-1 and C-3).

made with caution, since patient care is so closely allied with clinical instruction of medical students and interns that it is hard to separate them statistically. Substantial differences in the functional distribution of FTE medical school scientists are evident when compared with all other university scientists, as 72 percent of their time is devoted to teaching, as shown in appendix tables C–2.

The large percentage of FTE scientists engaged in research in medical schools can be explained by the high rate of flow of research funds to the medical sciences for the improvement of the Nation's health care. The growth in the number of medical school scientists engaged in other activities during 1965–69 reflects the increased demand for the diagnosis and treatment of patients in affiliated hospitals, out-patient clinics, and community medical centers.

Virtually all of the scientists employed in medical schools in 1969 were life scientists, with biological scientists accounting for 14 percent and medical scientists, 84 percent. In contrast, only 11 percent of the scientists employed in other segments of universities were reported in the biological sciences and 6 percent in the medical sciences.

The highest earned degree of the large majority of faculty and other professional personnel in medical schools was understandably the M.D. or other health-professional doctorate. Of the 55,100 scientists in such schools, 38,800 (70 percent of the total) earned these degrees, compared with only 4 percent of the scientists or engineers employed in other organizational units of universities and colleges. On the other hand, scientists with Ph. D.'s comprised 19 percent of the professional staff in medical schools, compared with 49 percent in other units of institutions of higher education.[32]

As in previous years, the Middle Atlantic division ranked highest in the number of scientists employed in medical schools, accounting for 29 percent of the total, followed by the East North Central division with 16 percent and the South Atlantic division with 14 percent (appendix table C–3 and chart 16). Of the seven States that do not have medical schools, four are located in the Mountain division.

Graduate students

Of the 84,400 graduate students who received stipends for part-time services as scientists or engineers in 1969, only 5,800 (7 percent) were serving in medical schools (appendix table C–4). On an FTE basis, the medical graduate students numbered 2,800, with 47 percent engaged in research and development; 39 percent in teaching; and 14 percent in other activities. The functional distribution of graduate students in other organizational units of universities and colleges was 52 percent in research and development, 43 percent in teaching, and only 4 percent in other activities.

The medical sciences, of course, dominated the work of these graduate students, consuming 65 percent of their efforts; the biological sciences, 32 percent; and all other sciences, the remaining 3 percent. In contrast, graduate students in other university departments spent only 12 percent of their efforts in the biological sciences, 1 percent in the medical sciences, and the remaining 87 percent of their time in other fields of science.

As previously suggested, medical schools utilized graduate students as part-time scientists far less than did other units of universities and colleges in 1969. The average number of graduate students receiving stipends for medical school services was 15 per 100 full-time scientists employed in medical schools, compared with an average of 48 per 100 in all other units of universities and colleges.

Technicians

Medical schools employed 21,200 technicians in 1969, an increase of 3.9 percent per year over the 18,200 total in 1965. Virtually all of these technicians were employed in the life sciences, and 71 percent were primarily engaged in R&D performance, as shown in appendix table C–5.

Technician employment in medical schools

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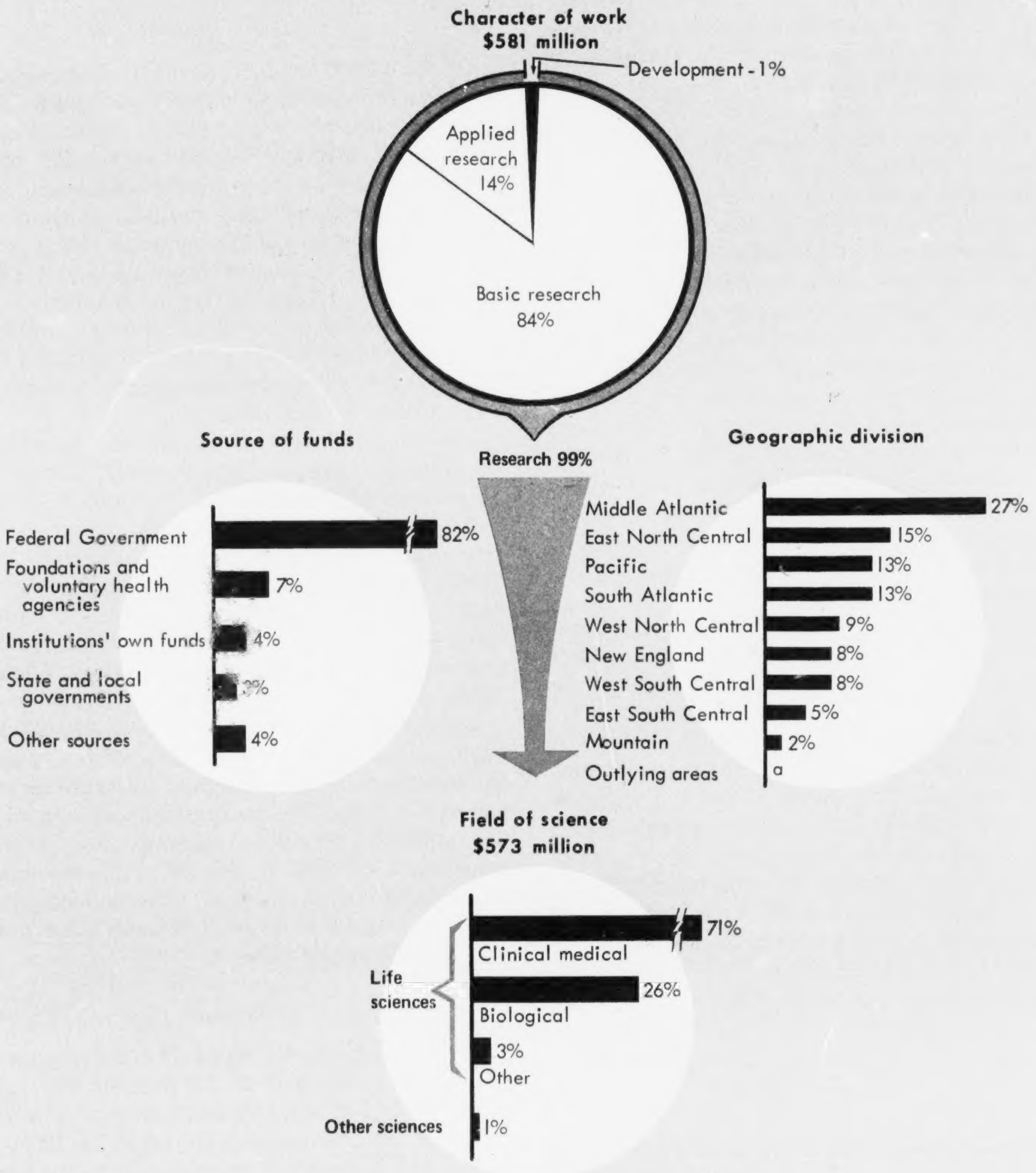
[32] For the purposes of the survey on which this report is based, persons with both a Ph. D. degree and an M.D. degree were classified in the Ph. D. category. Thus, statistics presented here and elsewhere in this report may slightly understate the number of scientists with M.D. degrees.

Chart 17.
Characteristics of separately budgeted R&D expenditures in medical schools, 1968.



[a] Less than 0.5 percent.

Source: National Science Foundation (appendix tables C-7 and C-8).

comprised 44 percent of the total for the entire higher education sector. In other organizational units, as well as in medical schools, more than two-thirds of the technicians were primarily employed in R&D activities. However, less than one-half of the 27,300 technicians in units outside medical schools were employed in the life sciences.

Financing of Scientific Activities

Of the $7 billion expended in 1968 by the entire university and college sector for research, development, and instruction, medical schools accounted for 20 percent, or approximately $1.4 billion. Current R&D expenditures amounted to approximately one-half, or $703 million, and consisted of $581 million for separately budgeted research and development and an estimated $122 million for R&D activities for which the institutions did not maintain separate records. The remainder was divided between $488 million for instruction (including indirect costs) and $189 million for capital expenditures, as shown in table 11.

Separately budgeted R&D expenditures

The amount allocated by medical schools in 1968 for separately budgeted R&D expenditures, $581 million, represented an increase of 13.4 percent per year over the $351 million reported in 1964 (appendix table C–6). During this 4-year period, Federal support remained constant at approximately 82 percent of the total. Non-Federal support amounting to $107 million in 1968 came principally from the foundations ($24 million), the institutions themselves ($23 million), and voluntary health agencies ($19 million).

Basic research continued to receive the greatest emphasis in medical school spending, with 84 percent of the total. Other units of universities spent 74 percent of their budgets on basic research (appendix table C–7). Minimal changes are observed from year to year in the proportion of the funding allocated to the biological sciences as compared with clinical medical sciences, as shown in appendix table C–6.

The 20 medical schools located in the Middle Atlantic division reported 27 percent of the total separately budgeted R&D expenditures and 26 percent of the Federal support (appendix table C–8). Ranking next in expenditures were the 14 schools in the East North Central division, with 15 percent, followed by medical schools in the Pacific and South Atlantic divisions, each accounting for 13 percent of the total (chart 17).

Current expenditures for instruction and departmental research

Direct expenditures for instruction and departmental research by medical schools amounted to $414 million in 1968, only 15 percent of the total reported by the whole university sector, with nearly all of it allocated to the life sciences, as shown in appendix table C–6. Indirect costs applicable to these direct expenditures represented 32 percent, as compared with 26 percent in 1964.

Capital expenditures

Spending for construction of facilities for research, development, and instruction was directed almost entirely toward support of the life sciences, with less than one-half of 1 percent going to all other disciplines combined. Appendix table C–6 illustrates the greater tendency for non-Federal sources to support these capital expenditures (58 percent in 1968) in contrast to their minor role in the support of separately budgeted R&D expenditures (18 percent). Total capital expenditures increased 15.7 percent per year, from $106 million in 1964 to $189 million in 1968, with the Middle Atlantic division accounting for the largest share of the funds, as indicated in appendix table C–8.

Part II. Federally Funded Research and Development Centers Administered by Universities and University Consortia

SECTION 1. Background

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS (FFRDC's) are organizations that were established to meet the particular R&D needs of Federal agencies. Such centers are operated for the Federal Government by universities and university consortia, independent nonprofit organizations, and industrial firms. This report is limited to summary data on the manpower and financial characteristics of FFRDC's administered by universities and university consortia. It should be noted also that data for university-administered FFRDC's presented in part II are separate and mutually exclusive from data for universities and colleges shown in part I of this report.[1]

Each FFRDC receives virtually all of its support from a single Federal agency, and it is tied to this sponsoring agency by a contractual relationship that is subject to varying degrees of monitorship. The centers differ in terms of basic objectives and primary focus of effort, but they share the distinct advantage of gathering in one place a nucleus of well-qualified scientists and technicians representing a variety of disciplines to carry out assigned research objectives. This provides the sponsoring agencies the advantages of university scientific and technical knowledge without actually bringing scientists and engineers into the Federal Government. It also makes managerial skills immediately available to sponsoring agencies and permits considerable flexibility in administering large-scale unified R&D programs.

Although several FFRDC's are physically located at considerable distances from the parent institutions, such as the Los Alamos Scientific Laboratory, New Mexico, administered by the University of California (Berkeley), most of them are in close proximity to their respective universities. Organizationally, however, the centers are usually separate from the administering institution, and although they may receive administrative support from their parent institutions, they are self-contained entities insofar as their R&D work is concerned.

The extent to which the basic research activities of university-administered FFRDC's interact with and strengthen the academic science capabilities of the administering university varies considerably. In many instances, faculty members hold joint appointments with the university and the FFRDC. Perhaps, the most important feature of FFRDC's with respect to the research and educational programs is the fact that most of them make their expensive facilities and equipment available to faculty and graduate students of the administering university and other universities for the conduct of research.

Prior to 1967 the decision as to whether a given center was to be classified as an FFRDC was made by the sponsoring Federal agency within a rather broad definitional framework. As a consequence, there were some significant shifts in classification of individual centers attributable largely to differences in criteria used to define an FFRDC. In 1967, the Federal Council for Science and Technology (FCST) established uniform criteria to be used by all agencies, and on the basis of these criteria the FCST issued a Government-wide Master List of

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[1] The presentation of separate statistics on university-administered FFRDC's and the exclusion of such statistics from those shown for universities and colleges differ from procedures followed by the U. S. Office of Education and other public and private organizations in publishing financial and employment statistics for institutions of higher education.

FFRDC's. As defined by the FCST, an FFRDC is an organizational unit that possesses the following principal characteristics:[2]

(1) Its primary activities include basic research, applied research, development, or R&D management;

(2) Organized as a separate operational unit and expected to have a long-term relationship with its sponsoring agency;

(3) Conducts R&D work upon direct request of, or under a broad charter, from the sponsoring Federal agency;

(4) Receives at least 70 percent of its financial support from the Federal Government; and

(5) Has an average annual budget of at least $500,000.

In 1969, when this survey was conducted, there were 36 university-administered FFRDC's, of which 28 were administered by individual universities, 7 by university consortia, and 1 administered jointly by a university and a university consortium.[3] As indicated previously, the number of centers has tended to increase during the years after World War II and changes in classification of centers have occurred from time to time. For example, the revised FCST definitions of FFRDC's in 1967 resulted in the deletion of 14 previously designated centers. Fourteen new FFRDC's have been added since 1967 and, thus, no net change occurred in the number of university-administered FFRDC's during 1967–69. In the interpretation of trend data shown in this report, however, one of the limitations that should be taken into account is the fluctuation in the number and types of FFRDC's that have occurred through the years.[4]

In 1969, the five Federal agencies sponsoring FFRDC's were the Atomic Energy Commission (AEC), the Department of Defense (DOD), the National Aeronautics and Space Administration (NASA), the Department of Health, Education, and Welfare (HEW), and the National Science Foundation (NSF). HEW's Office of Education reported FFRDC's for the first time in the current reporting period. Each of its 10 university-administered R&D centers concentrates on a specific problem area in education. The four NSF-sponsored FFRDC's are all administered by university consortia. Their major purpose is basic research in astronomy and related fields. Requests for use of facilities for research projects by visiting scientists are given the same consideration as requests submitted by the centers' staffs.

The seven university and four consortia-administered FFRDC's[5] under AEC sponsorship are basically mission oriented; however, the Argonne National Laboratory is presently planning to use its facilities to conduct pollution control studies. NASA sponsors only two FFRDC's, both of which are involved in research associated with the problems of lunar and interplanetary flights.

The changes in the number, type, and organizational structure of university-administered FFRDC's that have occurred in the years since they were first organized reflect the changing R&D objectives of both sponsoring agencies and administering universities. Since early 1969 when this survey was conducted, several further changes affecting the group of organizations sponsored by the Department of Defense have occurred. The Center for Research in Social Systems, administered by American University, severed its ties with the university and has become part of an independent nonprofit research institute. Similarly, the Human Resources Research Office, administered by George Washington University, has changed its status to that of an independent nonprofit FFRDC. The Army Mathematics Center relinquished its FFRDC status to become an integral part of the University of Wisconsin's mathematics department. Another change affecting the group was the termination of operations by Hudson Laboratories, administered by Columbia University.

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[2] For a more detailed description of the criteria used to define FFRDC's, see National Science Foundation, *Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1968, 1969, and 1970*, Vol. XVIII (NSF 69-31) (Washington D.C. 20402: Supt. of Documents, U. S. Government Printing Office, 1970), p. 97.

[3] See appendix D.

[4] Changes in classification to or from FFRDC status have usually involved relatively small centers with R&D performance amounting to $500,000 or less. The most consequential shift that occurred in 1967 was the reclassification of MIT's Instrumentation Laboratories from an FFRDC to a part of the university.

[5] Includes one FFRDC administered jointly by a university and a university consortium.

SECTION 2. Scientific and Technical Personnel

Scientists and Engineers

University-administered FFRDC's employed 11,500 scientists and engineers in 1969. Of this total, virtually all (97 percent) were employed full time (table 23). The foregoing figure includes professional staff holding principal appointments at the center, but does not include faculty and/or scientists and engineers employed in other organizational units of the administering university who may do research at the FFRDC.

Employment of scientists and engineers at FFRDC's increased at a rate of 2.8 percent per year between March 1958 and January 1969. This was less than one-half the annual rate of increase prevailing in universities and colleges during the same 11-year span. The relative number of full-time and part-time scientists and engineers did not vary much throughout the period.

Since the primary purpose of FFRDC's is R&D performance or management, it is not surprising that virtually all scientists and engineers are engaged in R&D work. The functional distribution of FTE scientists and engineers in 1969 was research and development, 98 percent, and teaching and other activities, 2 percent. In contrast, nearly two-thirds of the FTE scientists and engineers in universities and colleges were primarily engaged in teaching.

The level of educational attainment of scientists and engineers in university-administered FFRDC's is somewhat lower than that prevailing in universities and colleges. The earned-degree profile of such FFRDC personnel in 1969 was as follows: Ph. D., 33 percent; M.D. or other health-professional doctorate, 1 percent; master's degree, 24 percent; and bachelor's de-

TABLE 23.—*Scientists and engineers employed in university-administered FFRDC's,*[a] *by employment status, selected years, 1958–69*

Employment status	March 1958	March 1961	January 1965	January 1967	January 1969	Compound annual rate of increase, 1958–69 (percent)
	(Thousands)					
Number of scientists and engineers	8.5	8.9	11.0	10.7	11.5	2.8
Full time	8.3	8.7	10.8	10.5	11.2	2.7
Part time	.2	.2	.2	.2	.3	5.1
FTE scientists and engineers	8.4	8.8	10.9	10.6	11.3	2.7

[a] Federally Funded Research and Development Centers.

TABLE 24.—*Percent distribution of scientists and engineers employed in FFRDC's,*[a] *by level of educational attainment and field of employment, January 1969*

Level of educational attainment	Total	Engineers	Physical scientists	Mathematicians	All other scientists[b]
Number of scientists and engineers (thousands)[c]	11.5	5.1	4.4	1.1	.9
	Percent distribution				
Ph. D.	33.0	13.9	57.0	13.8	44.7
M.D., D.D.S., etc	.9	.3	---	---	9.3
Master's	24.3	29.0	17.1	31.2	25.4
Bachelor's	41.8	56.9	25.9	55.0	20.6

[a] Federally Funded Research and Development Centers.

[b] Includes social and life scientists and psychologists.

[c] Includes 345 part-time scientists and engineers.

gree or the equivalent, 42 percent (table 24).[6] In contrast, the distribution of scientists and engineers in universities and colleges was as follows: Ph. D., 43 percent; M.D. or other health-professional doctorate, 18 percent; master's degree, 29 percent; and bachelor's degree or the equivalent, 10 percent.

Differences in the earned-degree status between professional staff in universities and staff employed in university-administered FFRDC's are attributable to various factors, including the academic qualifications required to perform the type of activities carried out and the career preferences and objectives of individual scientists and engineers. In most universities the possession of an earned doctorate is one of the prerequisites for acquiring faculty rank with tenure. As a consequence, persons with the necessary academic qualifications usually seek career appointments in universities which lead to high faculty rank (professor, associate professor, or the equivalent) with tenure. Faculty rank and tenure can not be attained directly through an FFRDC appointment at most universities, although such status once acquired by a faculty member can be maintained while employed at a university-administered FFRDC. According to an NSF survey conducted in 1961, 4 percent of the scientists and engineers employed by university-administered FFRDC's held faculty status.[7]

As might be expected, the R&D activities of FFRDC's are closely associated with the missions of their sponsoring agencies. This situation is directly reflected in the scientific disciplines of scientists and engineers employed at such centers. The field distribution of the 11,500 scientists and engineers in 1969 was as follows: Engineers, 44 percent; physical scientists, 38 percent; mathematicians, 9 percent; and all remaining fields, 8 percent (appendix table D–1). Although the 14 FFRDC's administered by public universities employed the largest number of scientists and engineers, the 14 FFRDC's administered by private universities accounted for the most engineers and mathematicians. Among the principal disciplinary fields, it is interesting to note that the majority of physical scientists held doctorates, while the majority of mathematicians and engineers held bachelor's degrees (table 24).

The geographic distribution of scientists and engineers by region for 1969 shows that the West accounted for one-third of the number of centers, but more than one-half of total employment. More than one-half of the engineers, physical scientists, and mathematicians were concentrated in this area. The Northeast region ranked second in importance, although accounting for less than one-fifth of total scientist and engineering employment (appendix table D–1).

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[6] FFRDC's administered by other nonprofit institutions also employed more bachelor's-degree holders than those with master's or doctorates. See National Science Foundation, *Scientific Activities of Nonprofit Institutions, 1966* (NSF 69–16) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969), p. 63.

[7] National Science Foundation, *Scientists and Engineers in Colleges and Universities, 1961* (NSF 65–8) (Washington, D. C. 20402: Supt. of Documents, Government Printing Office, 1964), p. 18.

Graduate Students

Two-thirds of the FFRDC's surveyed reported graduate students functioning on a part-time basis in a scientific capacity. All were engaged in R&D work and most (57 percent) were in the physical sciences. The number of graduate students engaged part-time as scientists and engineers increased from 700 in 1967 to 900 in 1969. This was due largely to the number of graduate students engaged in research in the social and psychological sciences in the newly established FFRDC's sponsored by the Department of Health, Education, and Welfare. The number engaged in such research increased from less than 50 in 1967 to 300 in 1969, as shown in the following table:

Field	*January 1967*	*January 1969*
Number of graduate students	700	900
Engineers	100	100
Physical scientists	500	500
Psychologists and social scientists	[a]	300
All other scientists [b]	[a]	100

[a] Less than 50.

[b] Includes mathematicians and life scientists.

The utilization of graduate students as part-time scientists and engineers was highly concentrated in the West, as was the case with other scientific activities of FFRDC's (appendix table D–1). FFRDC's administered by private universities and those principally sponsored by the Atomic Energy Commission and the Department of Health, Education, and Welfare accounted for most of the graduate students receiving stipends for part-time services as scientists and engineers.

Technicians

Large numbers of technicians are employed by FFRDC's to support their professional staff. As would be expected, nearly all technicians (95 percent) are primarily engaged in research and development. Employment is highly concentrated in the engineering and physical sciences, with more than 90 percent of total technicians working in these disciplines. Employment by field of science for 1969 was as follows:

Field	*January 1969*	
	Total	*Percent in R&D*
Number of technicians	9,100	95
Engineering and physical sciences	8,500	94
Life sciences	500	100
Social sciences	100	100

The ratio of technicians to FTE scientists and engineers in FFRDC's averaged 80 per 100 in 1969. The West employed the largest number of technicians but had one of the lowest technician-to-scientist or engineer ratios (appendix table D–1). Technicians were most numerous in FFRDC's administered by private universities. However, the ratio of technicians to FTE scientists or engineers was highest in consortia-administered centers. FFRDC's sponsored by the Atomic Energy Commission not only accounted for the most technicians, but had the highest ratio of technicians to FTE scientists or engineers (106 per 100).

SECTION 3. Financing of Scientific Activities

OUTLAYS FOR RESEARCH AND DEVELOPMENT in the 36 university-administered FFRDC's totaled $855 million in 1968, including $719 million for current R&D expenditures (84 percent of the total) and $136 million for capital outlays (16 percent). Although these organizations contribute to the educational process by providing research opportunities for faculty and students, they do not conduct instructional programs in the sciences and engineering as defined for survey purposes. The principal characteristics of R&D financing in these organizations are discussed in this section.

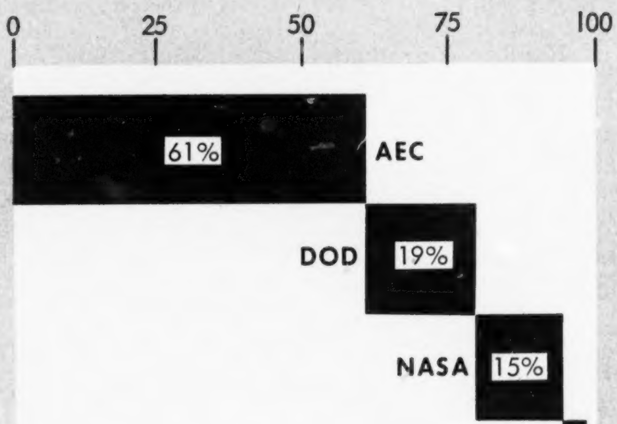
Current R&D Expenditures

Current R&D expenditures in university-administered FFRDC's totaling $719 million in 1968 were almost completely financed by the Federal Government.[8] The 1968 total represented an annual rate of increase of 6.9 percent over the $630 million recorded in 1966 (appendix table D–2). This was somewhat lower than the 10-percent annual rate of increase during 1958–66 and reflects the slowdown in the growth of Federal R&D funding in the late 1960's that affected both universities and colleges and university-administered FFRDC's.

In recent years the R&D effort at FFRDC's has shifted from development to basic research (appendix table D–2). However, the level of basic research performed by FFRDC's (38 percent) is still only one-half the relative level of effort expended on this type of R&D activity by universities and colleges (77 percent). FFRDC's sponsored by the Atomic Energy Commission accounted for 61 percent of the R&D expenditures of university-administered FFRDC's. This included 67 percent of all basic research, 63 percent of all applied research, and 50 percent of total development expenditures (appendix table D–3 and chart 18). FFRDC's

Chart 18.
Distribution of current R&D expenditures in university-administered FFRDC's, [a] by sponsoring Federal agency, 1968.

Total: $719 million [b]



[a] Federally Funded Research and Development Centers.
[b] Includes $3.6 million for R&D performance financed by non-Federal funds.

Source: National Science Foundation (appendix table D-3).

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[8] Since all current R&D expenditures of university-administered FFRDC's are "separately budgeted" by definition, the term, "separately budgeted" will not be used in describing the R&D expenditures of these organizations.

sponsored by the National Science Foundation allocated the highest percentage of total R&D expenditures to basic research (95 percent).

Basic and applied research comprised 70 percent ($507 million) of total R&D expenditures. The physical and environmental sciences were the most heavily supported fields in both 1966 and 1968, with 70 percent or more of the total in each of the years (table 25). This emphasis on the physical and environmental sciences is not surprising as these are the primary fields of interest for four of the six largest FFRDC's. In contrast to FFRDC's, universities and colleges allocated almost one-half of their basic and applied research funds to life sciences.

The greater portion of R&D funds was spent by the 12 FFRDC's located in the West (appendix table D–3). The six centers located in California alone accounted for $290 million, or 40 percent of total research expenditures.

FFRDC's administered by public universities recorded the highest level of R&D expenditures (appendix table D–3). A large portion (45 percent) was spent by these centers on applied research. The eight FFRDC's administered by university consortia expended more money on basic research than FFRDC's administered by public or private universities. FFRDC's administered by private universities accounted for the largest amount of development expenditures.

Capital Expenditures

Twenty-eight FFRDC's reported capital expenditures for research and development totaling $136 million in 1968, virtually all of which was received from the Federal Government. More than nine-tenths of total capital expenditures were made by FFRDC's sponsored by the Atomic Energy Commission and the National Aeronautics and Space Administration (appendix table D–3).

Expenditures for scientific and engineering facilities and equipment in 1968 were 7 percent below the 1966 level (table 26). As would be expected the bulk of capital expenditures was for R&D facilities and equipment for the physical and environmental sciences. Expenditures for engineering R&D facilities and equipment, however, showed the greatest increase between 1966 and 1968 and comprised 28 percent of total capital expenditures in FFRDC's in 1968. Of the $136 million in total capital expenditures, 78 percent was expended by FFRDC's administered by private universities and university consortia. More than three-fifths ($83 million) of total capital expenditures were by FFRDC's located in the West (appendix table D–3).

TABLE 25.—*Current expenditures for research in university-administered FFRDC's,[a] by field of science, 1966 and 1968*[b]

(Dollars in millions)

Field of science	1966		1968	
	Amount	Percent distribution	Amount	Percent distribution
Total	$433.6	100.0	$506.8	100.0
Engineering	54.9	12.7	75.4	14.9
Physical and environmental sciences	322.5	74.4	354.7	70.0
Mathematics	22.6	5.2	18.3	3.6
Life sciences	26.9	6.2	27.0	5.3
All other sciences	6.6	1.5	31.4	6.2

[a] Federally Funded Research and Development Centers.

[b] Excludes development amounting to $195.9 million in 1966 and $212.1 million in 1968, for which the survey did not request field-of-science distribution.

TABLE 26.—*Capital expenditures for scientific and engineering facilities and equipment in university-administered FFRDC's,[a] by field of science, 1966 and 1968*

(Dollars in millions)

Field of science	1966		1968	
	Amount	Percent distribution	Amount	Percent distribution
Total	$147.4	100.0	$136.5	100.0
Engineering	14.2	9.6	38.6	28.3
Physical and environmental sciences	118.0	80.0	88.6	64.9
Mathematics	11.5	7.8	5.5	4.0
Life sciences	3.6	2.4	2.9	2.1
All other sciences	.1	.1	1.0	.7

[a] Federally Funded Research and Development Centers.

APPENDIXES

A. Technical notes and tables

B. Universities and colleges (part I): Statistical tables and reproduction of survey form (including aggregate data)

C. Medical schools: Listing, statistical tables, and reproduction of survey form (including aggregate data)

D. FFRDC's (part II): Listing, statistical tables, and reproduction of survey forms (including aggregate data)

E. Covering letter and survey form instructions

APPENDIX A

Technical Notes

Scope and Coverage

For the purposes of this survey, the term "universities and colleges" was defined to include all institutions in the United States and its territories offering 2 or more years of post-secondary education that met the criteria for inclusion in the U.S. Office of Education's Directory[1] and that provided programs in the sciences and engineering. Excluded from survey coverage were about 350 institutions, most of them small independent schools of music, art, theology, or law, and any other specialized institutions that did not maintain programs in the sciences and engineering. Survey data were obtained by mail questionnaires sent to each university or college president, who was asked to designate an official to respond for all branches or divisions of his institution, both on and off the main campus. The initial mailout of the survey questionnaires was made on January 31, 1969, and nonrespondent institutions received followup letters and additional questionnaires in March and May, with intensive telephone followup with any large nonrespondents continuing through June and July. The data-collection phase of the survey was completed on July 31, 1969.

The survey also requested separate data for 101 medical schools, of which 79 are integral parts of universities and 22 maintain independent status, because of the wide public interest in the medical and health-related research and educational activities carried out by such schools. A list of these medical schools appears in appendix C. In addition, data on 36 university-administered Federally Funded Research and Development Centers were obtained because of their unique characteristics with respect to the performance and administration of R&D projects or sponsoring Federal agencies. Statistical data on universities and colleges in part I of this report and data on university-administered FFRDC's in Part II are presented separately and are mutually exclusive. The list of university-administered FFRDC's covered in the survey is shown in appendix D. The geographic distribution of universities and colleges canvassed in the survey, by type of institution (based on highest degree granted in the sciences and engineering) is shown in appendix table A–1.

Of the 2,175 universities and colleges that were sent questionnaires, 1,676 (or 77 percent) returned usable data (appendix table A–2). In addition, 88 percent of the 101 medical schools and all 36 of the FFRDC's canvassed in the survey returned completed questionnaires. The response rates among types of institutions varied directly by level of degree granted in the sciences and engineering, as follows: doctorate-granting institutions, 93 percent; master's, 84 percent; bachelor's, 80 percent; and institutions not granting science degrees, 69 percent. One of the factors accounting for the relatively high response rate of doctorate institutions was the intensive followup of such institutions by mail and telephone to encourage their participation in the survey. In contrast, the below-average response rate for institutions not granting science degrees, particularly small liberal arts colleges and junior colleges, was partly due to their reluctance to participate in the survey because they had so few resources to report. The failure of institutions with small science or engineering programs to participate in the survey did not have a very consequential effect on overall survey findings since they account for only a small proportion of the Nation's academic science activities.

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[1] U.S. Department of Health, Education, and Welfare, U.S. Office of Education, *Education Directory, 1968-69, Part 3: Higher Education* (OE–50000–69) (Washington, D.C. 20402: Supt. of Documents, U. S. Government Printing Office, 1968).

Methods of Estimating for Nonresponse

In order to derive the universe estimates of manpower and financial resources presented in this report, estimates were made for those institutions that failed to respond to the survey, as well as for respondent institutions that failed to supply complete data. These estimates were based on information obtained from institutional catalogs and financial reports, other institutional sources (including responses to other surveys conducted by the National Science Foundation and the U.S. Office of Education[2]) and secondary sources, particularly the U.S. Office of Education's *Financial Statistics of Institutions of Higher Education* and *Number and Characteristics of Employees in Institutions of Higher Education*,[3] the American Council on Education's *American Universities and Colleges*,[4] and the American Association of Junior Colleges' *Junior Colleges Directory*.[5]

For institutions that failed to return questionnaires, estimates for certain key variables were based on data obtained from the secondary sources listed above. These key variables included: Scientists and engineers employed (full and part time); graduate students receiving compensation for part-time services as scientists and engineers; scientific and engineering technicians; total and federally funded separately budgeted R&D expenditures; current direct expenditures for instruction and departmental research; and total and federally funded capital expenditures in the sciences and engineering. The totals thus derived were allocated by machine methods among the various sublevels of detail on the basis of the distributional pattern existing in respondent institutions of the same type. This procedure was also followed in the case of those institutions that supplied totals for certain items, such as the number of full-time scientists and engineers, but were unable to distribute such personnel by field of employment or by function in which they were primarily employed.

For institutions that responded to certain items but omitted others, a system of ratios between key variables was devised for use in editing questionnaires. For example, if an institution reported the number of scientists and engineers engaged in teaching but did not report any expenditures for instruction and departmental research, the latter figure was estimated on the basis of relationships developed from previous surveys: $8,000 per FTE teacher for institutions not granting science degrees; $12,000 per FTE teacher if the institution granted a bachelor's degree; and $14,000 per FTE teacher if the institution granted graduate degrees. The amount of estimating contained in this report varied from item to item, being lowest for total separately budgeted research and development (3 percent) and highest for current expenditures for instruction and departmental research (23 percent), which reflected the greater difficulty experienced by many institutions in arriving at the latter figure (appendix table A–3).

Limitations

Statistics presented in this report on the 1969 survey are not subject to a sampling error, since the survey canvassed all universities and colleges that were known or thought to have science and engineering programs. They are, however, subject to certain limitations attributable to such factors as survey nonresponse, failure of individual respondents to interpret survey definitions in the same way, and inadequacy or incompleteness of records on scientific activities available at some institutions.

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[2] Besides earlier surveys in this series, data were obtained from the latest surveys in the NSF's *Federal Support Universities and Colleges* series, conducted for the Committee on Academic Science and Engineering, and the U. S. Office of Education's *Higher Education General Information Survey*, (HEGIS 4).

[3] U. S. Department of Health, Education, and Welfare, Office of Education, *Financial Statistics of Institutions of Higher Education: Current Funds Revenues and Expenditures, 1965–66* (OE–52010–66) and *Number and Characteristics of Employees in Institutions of Higher Education, Fall 1966* (OE–50057–66) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1969).

[4] Otis A. Singletary, *American Universities and Colleges, 10th Edition* (Washington, D.C. 20036: American Council on Education, 1968).

[5] William A. Harper, ed., *1968 Junior College Directory: covering September 1966–August 1967 and Fall Enrollments for 1967* (Washington, D.C. 20036: American Association of Junior Colleges, 1968).

The principal limitation of statistical measures of scientific activities results from difficulties encountered by respondents in interpreting and applying survey definitions. Records available at many institutions of higher education do not readily yield exact information of financial and manpower resources allocated to scientific activities, as defined for survey purposes. Where exact information was not available, respondents were asked to supply estimates. In such cases, it is reasonable to assume that estimates will vary somewhat among institutions in accuracy, depending on the types and completeness of the records from which the estimates are made.

The magnitude of response error attributable to lack of records and to difficulties in interpreting or applying the definitions cannot be estimated. However, institutional accounting procedures, particularly in universities with large science and engineering programs, yield relatively accurate data on the disposition of restricted funds, such as separately budgeted research and development. Furthermore, the fact that the 1969 survey was the third in the biennial series encouraged some respondents to improve their recordkeeping procedures so that information on scientific activities regularly requested by the National Science Foundation was more readily assembled.

In addition to overall limitations characterizing the measurement of resources for scientific activities, it should be noted that the respondents are able to report more accurately and consistently on some activities than on others. For example, institutional records on separately budgeted R&D expenditures permit better reporting than do their records on instruction and departmental research expenditures. Similarly, their records relating to the employment of scientists and engineers appear to be more accessible than their records on technician employment. Any special limitations relating to particular manpower or financial characteristics are discussed in those sections of the report to which the limitations specifically relate.

In interpreting trend data on the financing of research, development, and instruction in the sciences and engineering, account should be taken of the fact that financial data included in this report are shown in current dollars for each of the designated years. Thus, they do not reflect the decline in the purchasing power of the dollar that has occurred during the 1953–68 period covered by NSF surveys. It should also be noted that trend data on current instruction expenditures and capital expenditures in the sciences and engineering are available only for 1964–68, while estimates of total current R&D expenditures are presented for the entire 15-year period.

TABLE A–1.—*Number of universities and colleges included in the survey of scientific and engineering activities of institutions of higher education, by State and type of institution, 1969* [a]

State	Total	Institutions granting—				
		Doctorate		Master's	Bachelor's	No science degree
		Total[b]	Medical schools[c]			
United States, total	2,175	220	101	328	726	901
New England	189	21	8	28	57	83
Maine	16	1	-----	2	7	6
New Hampshire	15	2	1	1	6	6
Vermont	18	1	1	3	6	8
Massachusetts	90	11	3	13	27	39
Rhode Island	10	2	1	2	2	4
Connecticut	40	4	2	7	9	20
Middle Atlantic	335	50	20	65	108	112
New York	176	31	11	35	46	64
New Jersey	43	6	2	7	10	20
Pennsylvania	116	13	7	23	52	28
East North Central	331	28	14	49	136	118
Ohio	67	6	3	12	35	14
Indiana	37	4	1	7	22	4
Illinois	108	10	5	10	37	51
Michigan	74	4	3	12	22	36
Wisconsin	45	4	2	8	20	13
West North Central	251	16	10	26	103	106
Minnesota	47	1	1	8	12	26
Iowa	49	2	1	3	25	19
Missouri	59	5	3	4	26	24
North Dakota	13	2	1	-----	5	6
South Dakota	15	2	1	2	9	2
Nebraska	23	2	2	5	8	8
Kansas	45	2	1	4	18	21
South Atlantic	369	28	16	36	137	168
Delaware	5	1	-----	-----	1	3
Maryland	39	2	2	1	16	20
District of Columbia	17	5	3	1	4	7
Virginia	49	4	2	11	15	19
West Virginia	20	1	1	1	15	3
North Carolina	94	4	3	6	33	51
South Carolina	37	3	1	3	17	14
Georgia	51	5	2	5	23	18
Florida	57	3	2	8	13	33
East South Central	167	11	7	24	62	70
Kentucky	32	2	2	5	16	9
Tennessee	50	4	3	10	23	13
Alabama	44	2	1	7	13	22
Mississippi	41	3	1	2	10	26
West South Central	187	23	10	36	54	74
Arkansas	20	1	1	4	12	3
Louisiana	26	5	3	9	7	5
Oklahoma	32	3	1	4	10	15
Texas	109	14	5	19	25	51
Mountain	87	18	4	11	24	34
Montana	12	2	-----	1	6	3
Idaho	11	1	-----	1	4	5
Wyoming	7	1	-----	-----	-----	6
Colorado	25	5	1	3	8	9
New Mexico	12	3	1	4	2	3
Arizona	11	2	1	1	1	7
Utah	7	3	1	-----	3	1
Nevada	2	1	-----	1	-----	-----
Pacific	249	24	11	51	41	133
Washington	37	2	1	10	3	22
Oregon	32	3	1	7	5	17
California	172	17	8	33	31	91
Alaska	3	1	-----	1	-----	1
Hawaii	5	1	1	-----	2	2
Outlying areas	10	1	1	2	4	3

[a] Excludes about 350 independent schools of music, art, theology, law, and other specialized institutions that do not conduct science or engineering programs. Also excludes 38 university-administered FFRDC's, which are listed in appendix D.

[b] The number of doctorate-granting institutions shown here may differ from similar figures published elsewhere for the following principal reasons: (1) Lack of uniformity in classifying branches, affiliates, or other organizational components of university systems; (2) differing definitions of science and engineering fields; and (3) variations in the time-span covered by the classification (e.g. single year or longer period).

[c] Includes three institutions granting M.D. degrees that do not grant Ph. D. or Sc. D. degrees in the sciences or engineering. However, they are included as doctorate-granting institutions for the purpose of treating all medical schools uniformly.

TABLE A–2.—*Number of universities and colleges included in the survey of scientific activities of institutions of higher education and number that responded, by type of institution, 1969*

Type of institution	Number of surveyed universities and colleges	Respondents	
		Number	Percent of total
Total	2,175	1,676	77.1
Doctorate	220	205	93.2
Medical schools	101	89	88.1
Master's	328	276	84.1
Bachelor's	726	577	79.5
No science degree	901	618	68.6

TABLE A–3.—*Estimated percent of universe totals for selected employment and financial characteristics of the scientific and engineering activities of universities and colleges, by type of institution, 1968 and January 1969* [a]

(Percent)

Item	All universities and colleges	Institutions granting—				
		Doctorate		Master's	Bachelor's	No science degree
		Total	Medical schools			
Employment characteristics, January 1969:						
Full-time scientists and engineers	17.1	17.9	19.3	9.6	15.4	23.2
Part-time scientists and engineers	18.2	18.2	13.6	7.4	12.3	28.2
Graduate students receiving stipends for part-time services as scientists and engineers	10.9	11.2	10.6	7.4	(b)	(b)
Technicians	21.6	20.8	18.9	26.0	32.2	36.0
Financial characteristics, 1968:						
Separately budgeted R&D expenditures	2.7	2.2	10.1	19.3	13.9	55.4
Federally financed separately budgeted R&D expenditures	4.2	3.8	12.7	20.6	14.9	50.5
Instruction and departmental research expenditures	23.3	18.4	20.9	29.8	33.7	41.8
Total capital expenditures	11.9	10.2	7.1	13.7	9.9	29.7
Federally financed capital expenditures	12.7	9.1	13.6	28.5	11.5	36.7

[a] Values were imputed to allow for nonresponse. For example, the imputed dollar volume of separately budgeted R&D expenditures of nonrespondent institutions amounted to $58 million, or 2.7 percent of the $2.1 billion universe total for all universities and colleges, both respondents and nonrespondents.

[b] Not applicable.

APPENDIX B

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Universities and Colleges (Part I)

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TABLE B–1.—*Number of scientists and engineers employed in universities and colleges, by type of institution and employment status, 1965, 1967, and 1969*

Type of institution and employment status	January 1965	January 1967	January 1969
Total	188,470	217,160	253,536
Full time	147,674	172,752	204,041
Part time	40,796	44,408	49,495
Doctorate	127,799	146,981	166,360
Full time	99,531	116,641	133,083
Part time	28,268	30,340	33,277
Master's	21,078	24,729	33,211
Full time	17,434	20,748	28,595
Part time	3,644	3,981	4,616
Bachelor's	22,423	23,025	24,808
Full time	18,673	19,328	20,731
Part time	3,750	3,697	4,077
No science degree	17,170	22,425	29,157
Full time	12,036	16,035	21,632
Part time	5,134	6,390	7,525

TABLE B-2.—*Number of scientists and engineers employed in universities and colleges, by field and employment status, 1965, 1967, and 1969*

Field and employment status	January 1965	January 1967	January 1969
Total	188,470	217,160	253,536
Full time	147,674	172,752	204,041
Part time	40,796	44,408	49,495
Engineers	21,953	25,531	25,827
Full time	18,010	21,058	21,431
Part time	3,943	4,473	4,396
Physical scientists	26,048	31,608	34,279
Full time	22,691	27,558	30,029
Part time	3,357	4,050	4,250
Mathematicians	13,600	17,675	22,812
Full time	10,934	14,316	18,407
Part time	2,666	3,359	4,405
Life scientists	83,762	90,274	102,808
Full time	61,684	68,298	79,148
Part time	22,078	21,976	23,660
Psychologists	9,449	11,294	14,941
Full time	6,963	8,506	11,576
Part time	2,486	2,788	3,365
Social scientists	32,603	39,583	52,869
Full time	26,494	32,256	43,450
Part time	6,109	7,327	9,419
Other scientists, n.e.c.	1,055	1,195	(a)
Full time	898	760	(a)
Part time	157	435	(a)

[a] Separate data not collected.

TABLE B-3.—*Number of scientists and engineers employed in universities and colleges, by function in which primarily employed, type of institution, and field of employment, January 1969*

Function and type of institution	Total	Engineers	Physical scientists	Mathematicians	Life scientists	Psychologists	Social scientists
All functions, total	253,536	25,827	34,279	22,812	102,808	14,941	52,869
Doctorate	166,360	18,241	19,146	9,545	88,699	6,595	24,134
Master's	33,211	2,605	6,439	4,642	4,974	3,316	11,235
Bachelor's	24,808	1,387	4,447	3,433	4,323	2,247	8,971
No science degree	29,157	3,594	4,247	5,192	4,812	2,783	8,529
Teaching	176,458	19,528	26,317	20,528	52,778	12,394	44,913
Doctorate	94,822	12,420	11,824	7,634	39,578	4,747	18,619
Master's	31,271	2,380	6,054	4,471	4,593	3,106	10,667
Bachelor's	23,352	1,293	4,277	3,341	4,023	2,109	8,309
No science degree	27,013	3,435	4,162	5,082	4,584	2,432	7,318
Research and development	48,620	5,261	7,187	1,787	28,805	1,426	4,154
Doctorate	47,176	5,083	6,799	1,646	28,413	1,297	3,938
Master's	943	141	285	89	200	71	157
Bachelor's	437	33	94	46	189	26	49
No science degree	64	4	9	6	3	32	10
Other activities	28,458	1,038	775	497	21,225	1,121	3,802
Doctorate	24,362	738	523	265	20,708	551	1,577
Master's	997	84	100	82	181	139	411
Bachelor's	1,019	61	76	46	111	112	613
No science degree	2,080	155	76	104	225	319	1,201

TABLE B-4.—*Number of scientists and engineers employed in universities and colleges, by detailed field of employment and type of institution, January 1969*

Field of employment	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total	253,536	166,360	33,211	24,808	29,157
Engineers	25,827	18,241	2,605	1,387	3,594
Aeronautical	1,371	1,134	69	113	55
Chemical	1,776	1,485	153	42	96
Civil	4,002	2,695	530	166	611
Electrical	6,940	4,664	663	388	1,225
Mechanical	4,896	3,083	585	348	880
Other engineers	6,842	5,180	605	330	727
Physical scientists	34,279	19,146	6,439	4,447	4,247
Chemists	14,511	7,448	2,761	2,362	1,940
Earth scientists	5,609	3,338	1,266	411	594
Physicists	11,932	6,892	2,127	1,535	1,378
Other physical scientists	2,227	1,468	285	139	335
Mathematicians	22,812	9,545	4,642	3,433	5,192
Life scientists	102,808	88,699	4,974	4,323	4,812
Agricultural	15,338	14,242	570	138	388
Biological	29,499	18,983	3,986	3,182	3,348
Medical	57,971	55,474	418	1,003	1,076
Psychologists	14,941	6,595	3,316	2,247	2,783
Social scientists	52,869	24,134	11,235	8,971	8,529
Economists	10,498	5,488	2,104	1,721	1,185
Sociologists	9,472	4,096	2,157	1,716	1,503
Political scientists	7,966	3,377	1,943	1,364	1,282
Historians	14,460	4,616	3,770	3,118	2,956
Other social scientists	10,473	6,557	1,261	1,052	1,603

TABLE B-5.—*Number of scientists and engineers employed in universities and colleges, by type of institution, level of educational attainment, and field of employment, January 1969*

Type of institution and educational attainment	Total	Engineers	Physical scientists	Mathematicians	Life scientists	Psychologists	Social scientists
All institutional types	253,536	25,827	34,279	22,812	102,808	14,941	52,869
Ph. D	107,866	11,589	21,767	8,528	31,645	9,172	25,165
M.D., D.D.S., etc	45,619	106	194	108	44,472	276	463
Master's	73,855	9,086	9,235	12,041	14,973	4,784	23,736
Bachelor's	26,196	5,046	3,083	2,135	11,718	709	3,505
Doctorate-granting institutions	166,360	18,241	19,146	9,545	88,699	6,595	24,134
Ph. D.	77,085	10,181	14,406	5,937	26,406	4,995	15,160
M.D., D.D.S., etc	43,950	98	133	42	43,227	190	260
Master's	26,971	5,414	2,641	2,576	8,682	988	6,670
Bachelor's	18,354	2,548	1,966	990	10,384	422	2,044
Master's-granting institutions	33,211	2,605	6,439	4,642	4,974	3,316	11,235
Ph. D	17,739	975	4,231	1,626	3,045	2,277	5,585
M.D., D.D.S., etc	241	1	20	10	149	18	43
Master's	13,208	1,223	1,781	2,750	1,449	893	5,112
Bachelor's	2,023	406	407	256	331	128	495
Bachelor's-granting institutions	24,808	1,387	4,447	3,433	4,323	2,247	8,971
Ph. D	9,905	273	2,520	737	1,736	1,277	3,362
M.D., D.D.S., etc	976	3	21	33	796	29	94
Master's	12,392	714	1,712	2,419	1,562	894	5,091
Bachelor's	1,535	397	194	244	229	47	424
Institutions not granting science degrees	29,157	3,594	4,247	5,192	4,812	2,783	8,529
Ph. D	3,137	160	610	228	458	623	1,058
M.D., D.D.S., etc	452	4	20	23	330	39	66
Master's	21,284	1,735	3,101	4,296	3,280	2,009	6,863
Bachelor's	4,284	1,695	516	645	774	112	542

TABLE B–6.—*Number of scientists and engineers employed in universities and colleges, by State, 1965, 1967, and 1969*

State	January 1965	January 1967	January 1969
United States, total	188,470	217,160	253,536
New England	15,256	18,383	21,033
Maine	666	627	738
New Hampshire	831	947	979
Vermont	852	865	922
Massachusetts	8,986	11,508	12,864
Rhode Island	852	969	1,056
Connecticut	3,069	3,467	4,474
Middle Atlantic	39,585	45,533	52,210
New York	23,536	27,695	30,572
New Jersey	3,830	4,262	5,257
Pennsylvania	12,219	13,576	16,381
East North Central	33,631	38,453	46,293
Ohio	9,211	10,654	11,968
Indiana	3,790	4,306	5,130
Illinois	9,115	10,297	13,652
Michigan	7,414	8,380	8,478
Wisconsin	4,101	4,816	7,065
West North Central	14,990	17,295	20,790
Minnesota	3,579	4,047	4,805
Iowa	2,947	3,168	4,433
Missouri	3,438	4,413	5,427
North Dakota	649	823	902
South Dakota	682	744	778
Nebraska	1,235	1,384	1,500
Kansas	2,460	2,716	2,945
South Atlantic	24,766	28,697	35,214
Delaware	317	323	415
Maryland	4,842	5,501	6,557
District of Columbia	2,566	2,676	3,398
Virginia	2,605	3,460	4,538
West Virginia	1,302	1,456	1,688
North Carolina	4,629	5,522	6,488
South Carolina	1,470	1,746	2,264
Georgia	3,367	3,774	4,577
Florida	3,668	4,239	5,289
East South Central	8,922	9,815	12,033
Kentucky	2,069	2,251	2,887
Tennessee	3,172	3,440	4,228
Alabama	1,851	2,281	2,870
Mississippi	1,830	1,843	2,048
West South Central	14,233	16,723	20,300
Arkansas	1,289	1,555	1,710
Louisiana	3,117	3,435	4,004
Oklahoma	1,926	2,362	2,461
Texas	7,901	9,371	12,125
Mountain	8,884	10,015	11,248
Montana	735	782	843
Idaho	634	667	702
Wyoming	317	487	404
Colorado	2,769	3,750	3,988
New Mexico	886	1,084	1,313
Arizona	1,484	1,522	1,839
Utah	1,760	1,424	1,601
Nevada	299	299	558
Pacific	26,940	30,802	32,691
Washington	3,379	3,405	3,936
Oregon	2,729	2,817	3,207
California	20,125	23,593	24,223
Alaska	211	226	283
Hawaii	496	761	1,042
Outlying areas	1,263	1,444	1,724

TABLE B–7.—*Number of scientists and engineers employed in universities and colleges, by State and field of employment, January 1969*

State	Total	Engineers	Physical scientists	Mathematicians	Life scientists	Psychologists	Social scientists
United States, total	253,536	25,827	34,279	22,812	102,808	14,941	52,869
New England	21,033	2,773	3,155	1,692	7,858	1,188	4,367
Maine	738	102	108	95	151	58	224
New Hampshire	979	112	140	87	336	51	253
Vermont	922	61	109	72	424	45	211
Massachusetts	12,864	1,996	2,021	893	4,986	634	2,334
Rhode Island	1,056	114	185	135	304	67	251
Connecticut	4,474	388	592	410	1,657	333	1,094
Middle Atlantic	52,210	4,907	7,046	4,458	22,994	2,998	9,807
New York	30,572	2,569	3,867	2,456	14,292	1,764	5,624
New Jersey	5,257	660	903	649	1,300	421	1,324
Pennsylvania	16,381	1,678	2,276	1,353	7,402	813	2,859
East North Central	46,293	4,843	6,447	4,305	17,339	2,964	10,395
Ohio	11,968	1,146	1,378	892	5,619	658	2,275
Indiana	5,130	560	774	507	1,452	297	1,540
Illinois	13,652	1,537	2,135	1,446	4,976	936	2,622
Michigan	8,478	1,042	1,113	870	2,323	688	2,442
Wisconsin	7,065	558	1,047	590	2,969	385	1,516
West North Central	20,790	1,850	2,525	1,755	8,994	1,244	4,422
Minnesota	4,805	307	515	352	2,572	262	797
Iowa	4,433	436	477	332	1,764	248	1,176
Missouri	5,427	537	632	541	2,327	318	1,072
North Dakota	902	106	123	65	386	42	180
South Dakota	778	88	124	86	247	45	188
Nebraska	1,500	135	250	124	596	91	304
Kansas	2,945	241	404	255	1,102	238	705
South Atlantic	35,214	3,250	4,189	3,361	15,122	1,957	7,335
Delaware	415	67	56	45	85	26	136
Maryland	6,557	467	737	520	3,570	317	946
District of Columbia	3,398	383	285	249	1,377	203	901
Virginia	4,538	423	563	486	2,008	230	828
West Virginia	1,688	159	257	164	621	88	399
North Carolina	6,488	428	645	660	3,022	324	1,409
South Carolina	2,264	255	276	207	932	106	488
Georgia	4,577	435	527	396	1,936	264	1,019
Florida	5,289	633	843	634	1,571	399	1,209
East South Central	12,033	1,023	1,459	1,107	5,016	663	2,765
Kentucky	2,887	126	310	221	1,408	184	638
Tennessee	4,228	388	610	405	1,637	256	932
Alabama	2,870	358	311	309	1,062	128	702
Mississippi	2,048	151	228	172	909	95	493
West South Central	20,300	1,862	2,493	1,881	9,192	1,012	3,860
Arkansas	1,710	108	148	120	959	71	304
Louisiana	4,004	297	496	396	1,951	178	686
Oklahoma	2,461	254	277	194	1,036	129	571
Texas	12,125	1,203	1,572	1,171	5,246	634	2,299
Mountain	11,248	1,497	1,851	1,065	4,002	722	2,111
Montana	843	75	137	72	347	38	174
Idaho	702	90	110	73	235	46	148
Wyoming	404	69	65	46	120	26	78
Colorado	3,988	533	621	336	1,543	251	704
New Mexico	1,313	245	265	195	306	82	220
Arizona	1,839	275	344	182	485	152	401
Utah	1,601	149	184	106	835	88	239
Nevada	558	61	125	55	131	39	147
Pacific	32,691	3,694	4,945	3,055	11,407	2,135	7,455
Washington	3,936	470	587	346	1,544	247	742
Oregon	3,207	224	539	320	1,265	212	647
California	24,223	2,902	3,588	2,319	8,030	1,608	5,776
Alaska	283	35	52	26	67	21	82
Hawaii	1,042	63	179	44	501	47	208
Outlying areas	1,724	128	169	133	884	58	352

TABLE B–8.—*Number of scientists and engineers employed in universities and colleges, by State and level of educational attainment, January 1969*

State	Total	Ph. D.	M.D., D.D.S., etc.	Master's	Bachelor's
United States, total	253,536	107,866	45,619	73,855	26,196
New England	21,033	9,239	4,160	5,137	2,497
Maine	738	334	20	304	80
New Hampshire	979	472	131	292	84
Vermont	922	364	281	224	53
Massachusetts	12,864	5,501	2,992	2,778	1,593
Rhode Island	1,056	602	115	262	77
Connecticut	4,474	1,966	621	1,277	610
Middle Atlantic	52,210	20,925	13,313	13,993	3,979
New York	30,572	12,019	8,338	7,667	2,548
New Jersey	5,257	2,528	322	2,003	404
Pennsylvania	16,381	6,378	4,653	4,323	1,027
East North Central	46,293	20,542	7,673	13,308	4,770
Ohio	11,968	5,037	3,113	2,689	1,129
Indiana	5,130	2,874	402	1,428	426
Illinois	13,652	5,210	2,157	4,174	2,111
Michigan	8,478	4,111	613	3,060	694
Wisconsin	7,065	3,310	1,388	1,957	410
West North Central	20,790	9,161	3,326	6,458	1,845
Minnesota	4,805	2,325	715	1,154	611
Iowa	4,433	1,807	735	1,496	395
Missouri	5,427	2,195	1,204	1,701	327
North Dakota	902	350	23	341	188
South Dakota	778	381	16	327	54
Nebraska	1,500	711	241	456	92
Kansas	2,945	1,392	392	983	178
South Atlantic	35,214	13,782	6,878	10,694	3,860
Delaware	415	288	2	120	5
Maryland	6,557	2,073	2,162	1,686	636
District of Columbia	3,398	1,395	805	717	481
Virginia	4,538	1,774	922	1,274	568
West Virginia	1,688	665	252	607	164
North Carolina	6,488	2,633	1,087	2,028	740
South Carolina	2,264	768	388	728	380
Georgia	4,577	1,920	803	1,365	489
Florida	5,289	2,266	457	2,169	397
East South Central	12,033	5,056	1,826	4,220	931
Kentucky	2,887	1,304	615	851	117
Tennessee	4,228	1,943	686	1,230	369
Alabama	2,870	1,062	310	1,273	225
Mississippi	2,048	747	215	866	220
West South Central	20,300	7,517	2,884	6,058	3,841
Arkansas	1,710	528	236	673	273
Louisiana	4,004	1,658	646	1,133	567
Oklahoma	2,461	1,138	385	668	270
Texas	12,125	4,193	1,617	3,584	2,731
Mountain	11,248	5,782	1,347	3,122	997
Montana	843	568	86	222	17
Idaho	702	321	11	325	45
Wyoming	404	211	2	169	22
Colorado	3,988	1,643	669	1,245	431
New Mexico	1,313	858	104	257	94
Arizona	1,839	1,094	50	482	213
Utah	1,601	761	469	234	137
Nevada	558	326	6	188	38
Pacific	32,691	15,520	3,886	10,160	3,125
Washington	3,936	1,674	515	1,245	502
Oregon	3,207	1,497	383	904	423
California	24,223	11,642	2,957	7,585	2,039
Alaska	283	141	3	124	15
Hawaii	1,042	566	28	302	146
Outlying areas	1,724	342	326	705	351

TABLE B-9.—*FTE scientists and engineers employed in universities and colleges, by State and function, January 1969*

State	Total	Function		
		Teaching	R&D	Other activities
United States, total	222,948	145,917	51,042	25,989
New England	18,545	11,922	5,580	1,043
Maine	705	604	83	18
New Hampshire	887	674	164	49
Vermont	816	641	135	40
Massachusetts	11,182	6,785	3,857	540
Rhode Island	999	640	297	62
Connecticut	3,956	2,578	1,044	334
Middle Atlantic	42,799	28,227	10,443	4,129
New York	25,412	15,382	7,145	2,885
New Jersey	4,443	3,398	832	213
Pennsylvania	12,944	9,447	2,466	1,031
East North Central	39,849	26,524	9,206	4,119
Ohio	10,471	6,560	1,971	1,940
Indiana	4,857	3,683	776	398
Illinois	11,195	7,418	2,772	1,005
Michigan	7,429	4,894	2,060	475
Wisconsin	5,897	3,969	1,627	301
West North Central	19,130	12,547	3,792	2,791
Minnesota	4,160	2,894	688	578
Iowa	4,224	2,543	789	892
Missouri	4,943	3,046	1,277	620
North Dakota	878	484	175	219
South Dakota	743	558	134	51
Nebraska	1,393	1,163	174	56
Kansas	2,789	1,859	555	375
South Atlantic	31,849	19,880	6,408	5,561
Delaware	397	318	73	6
Maryland	5,748	3,172	1,407	1,169
District of Columbia	2,546	1,655	421	470
Virginia	4,072	2,717	684	671
West Virginia	1,548	1,107	292	149
North Carolina	6,207	3,699	1,026	1,482
South Carolina	2,048	1,405	283	360
Georgia	4,319	2,431	1,000	888
Florida	4,964	3,376	1,222	366
East South Central	11,279	7,779	1,965	1,535
Kentucky	2,701	1,928	414	359
Tennessee	3,960	2,733	791	436
Alabama	2,651	1,923	384	344
Mississippi	1,967	1,195	376	396
West South Central	18,844	11,837	3,679	3,328
Arkansas	1,654	902	278	474
Louisiana	3,718	2,716	463	539
Oklahoma	2,355	1,592	300	463
Texas	11,117	6,627	2,638	1,852
Mountain	10,740	6,128	2,793	1,819
Montana	816	559	91	166
Idaho	648	472	127	49
Wyoming	400	227	105	68
Colorado	3,851	2,095	1,012	744
New Mexico	1,245	568	448	229
Arizona	1,766	1,066	494	206
Utah	1,484	705	437	342
Nevada	530	436	79	15
Pacific	28,339	20,153	6,572	1,614
Washington	3,617	2,466	968	183
Oregon	2,788	1,613	794	381
California	20,696	15,407	4,366	923
Alaska	237	136	101	--------
Hawaii	1,001	531	343	127
Outlying areas	1,574	920	604	50

TABLE B–10.—*Number of graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, by field, 1965, 1967, and 1969*

Field	January 1965	January 1967	January 1969
Total	60,439	73,343	84,391
Engineers	10,411	12,440	13,420
Physical scientists	17,746	20,143	23,163
Mathematicians	4,993	6,287	7,696
Life scientists	15,814	19,476	20,023
Psychologists	3,257	4,003	5,421
Social scientists	8,143	10,584	14,668
Other scientists	75	410	([a])

[a] Separate data not collected.

TABLE B–11.—*Number of graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, by function, type of institution, and field, January 1969*

Function and type of institution	Total	Engineers	Physical scientists	Mathematicians	Life scientists	Psychologists	Social scientists
All functions, total	84,391	13,420	23,163	7,696	20,023	5,421	14,668
Doctorate	78,829	12,996	21,706	7,096	18,812	4,743	13,476
Master's	5,562	424	1,457	600	1,211	678	1,192
Teaching	44,837	5,286	12,001	5,824	9,072	3,137	9,517
Doctorate	40,859	4,992	10,905	5,337	8,169	2,703	8,753
Master's	3,978	294	1,096	487	903	434	764
Research and development	35,676	7,718	10,600	1,576	9,890	1,929	3,963
Doctorate	34,804	7,600	10,336	1,521	9,697	1,800	3,850
Master's	872	118	264	55	193	129	113
Other activities	3,878	416	562	296	1,061	355	1,188
Doctorate	3,166	404	465	238	946	240	873
Master's	712	12	97	58	115	115	315

TABLE B–12.—*Number of graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, by State, 1965, 1967, and 1969*

State	January 1965	January 1967	January 1969
United States, total	60,439	73,343	84,391
New England	5,463	6,095	6,799
Maine	115	144	163
New Hampshire	256	304	408
Vermont	110	147	164
Massachusetts	3,641	3,956	4,305
Rhode Island	495	556	613
Connecticut	846	988	1,146
Middle Atlantic	9,635	11,774	12,593
New York	5,186	6,679	6,993
New Jersey	1,202	1,277	1,454
Pennsylvania	3,247	3,818	4,146
East North Central	13,799	17,053	20,509
Ohio	2,681	3,435	3,896
Indiana	2,587	3,378	4,675
Illinois	3,702	4,718	5,403
Michigan	2,852	2,920	3,254
Wisconsin	1,977	2,602	3,281
West North Central	6,510	8,285	9,029
Minnesota	1,936	2,131	2,298
Iowa	1,371	1,862	1,960
Missouri	1,246	1,664	1,873
North Dakota	149	278	436
South Dakota	153	220	228
Nebraska	502	675	750
Kansas	1,153	1,455	1,484
South Atlantic	6,391	7,826	9,389
Delaware	391	452	467
Maryland	1,227	1,550	1,711
District of Columbia	584	618	760
Virginia	541	726	901
West Virginia	307	480	547
North Carolina	1,299	1,366	1,571
South Carolina	373	420	704
Georgia	571	835	974
Florida	1,098	1,379	1,754
East South Central	2,102	2,755	3,407
Kentucky	444	526	801
Tennessee	806	1,025	1,336
Alabama	524	633	704
Mississippi	328	571	566
West South Central	4,853	6,283	7,569
Arkansas	252	307	362
Louisiana	912	1,241	1,496
Oklahoma	1,059	1,132	1,025
Texas	2,630	3,603	4,686
Mountain	3,341	4,311	5,296
Montana	246	302	317
Idaho	138	202	178
Wyoming	62	193	246
Colorado	859	1,115	1,428
New Mexico	408	552	598
Arizona	952	978	1,146
Utah	574	828	1,201
Nevada	102	141	182
Pacific	8,265	8,876	9,697
Washington	1,378	1,656	2,007
Oregon	920	1,048	1,284
California	5,705	5,865	5,926
Alaska	67	50	72
Hawaii	195	257	408
Outlying areas	80	85	103

TABLE B-13.—*Number of graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, by State and field, January 1969*

State	Total	Engineers	Physical scientists	Mathematicians	Life scientists	Psychologists	Social scientists
United States, total	84,391	13,420	23,163	7,696	20,023	5,421	14,668
New England	6,799	1,384	2,099	508	1,554	350	904
Maine	163	20	27	12	55	8	41
New Hampshire	408	69	132	52	92	11	52
Vermont	164	10	47	12	75	9	11
Massachusetts	4,305	1,050	1,303	257	966	218	511
Rhode Island	613	95	252	73	69	30	94
Connecticut	1,146	140	338	102	297	74	195
Middle Atlantic	12,593	2,210	4,162	1,062	2,327	860	1,972
New York	6,993	1,040	2,258	489	1,467	536	1,203
New Jersey	1,454	325	454	159	199	119	198
Pennsylvania	4,146	845	1,450	414	661	205	571
East North Central	20,509	3,198	5,135	2,104	4,258	1,483	4,331
Ohio	3,896	791	1,003	320	932	303	547
Indiana	4,675	742	1,145	494	914	231	1,149
Illinois	5,403	998	1,270	534	1,075	421	1,105
Michigan	3,254	348	819	375	683	317	712
Wisconsin	3,281	319	898	381	654	211	818
West North Central	9,029	1,160	2,092	721	2,966	592	1,498
Minnesota	2,298	313	350	185	1,069	101	280
Iowa	1,960	213	645	125	531	101	345
Missouri	1,873	286	395	214	478	97	403
North Dakota	436	62	131	16	149	32	46
South Dakota	228	43	48	7	85	15	30
Nebraska	750	67	201	61	198	48	175
Kansas	1,484	176	322	113	456	198	219
South Atlantic	9,389	1,460	2,579	898	2,345	522	1,585
Delaware	467	102	128	41	87	30	79
Maryland	1,711	139	540	212	454	85	281
District of Columbia	760	70	206	44	198	52	190
Virginia	901	258	205	48	279	44	67
West Virginia	547	86	156	47	130	33	95
North Carolina	1,571	167	273	208	449	109	365
South Carolina	704	114	195	98	164	24	109
Georgia	974	196	258	94	228	51	147
Florida	1,754	328	618	106	356	94	252
East South Central	3,407	427	766	339	1,097	222	556
Kentucky	801	20	210	105	297	45	124
Tennessee	1,336	199	355	128	327	96	231
Alabama	704	114	124	95	241	53	77
Mississippi	566	94	77	11	232	28	124
West South Central	7,569	1,313	1,866	637	2,050	477	1,226
Arkansas	362	45	128	14	116	19	40
Louisiana	1,496	173	394	79	442	62	346
Oklahoma	1,025	121	156	144	375	63	166
Texas	4,686	974	1,188	400	1,117	333	674
Mountain	5,296	822	1,511	563	1,125	444	831
Montana	317	45	86	32	97	13	44
Idaho	178	23	64	18	60	3	10
Wyoming	246	15	88	29	57	19	38
Colorado	1,428	239	440	141	272	120	216
New Mexico	598	117	154	67	98	49	113
Arizona	1,146	169	303	140	235	92	207
Utah	1,201	200	307	128	271	123	172
Nevada	182	14	69	8	35	25	31
Pacific	9,697	1,429	2,908	853	2,277	471	1,759
Washington	2,007	307	555	190	448	118	389
Oregon	1,284	79	427	125	387	78	188
California	5,926	1,012	1,784	530	1,268	253	1,079
Alaska	72	----------	28	3	41	----------	----------
Hawaii	408	31	114	5	133	22	103
Outlying areas	103	17	45	11	24	----------	6

TABLE B-14.—*Total number of FTE graduate students receiving stipends for part-time services as scientists or engineers in universities and colleges, by State and function, January 1969*

State	Total number	Full-time equivalent			
		Total	Teaching	R&D	Other activities
United States, total	84,391	40,443	20,785	17,612	2,046
New England	6,799	3,217	1,595	1,425	197
Maine	163	90	68	22	----------
New Hampshire	408	193	85	59	49
Vermont	164	83	24	59	----------
Massachusetts	4,305	2,023	988	921	114
Rhode Island	613	300	153	142	5
Connecticut	1,146	528	277	222	29
Middle Atlantic	12,593	5,817	2,810	2,740	267
New York	6,993	3,095	1,514	1,428	153
New Jersey	1,454	692	343	341	8
Pennsylvania	4,146	2,030	953	971	106
East North Central	20,509	10,524	5,397	4,439	688
Ohio	3,896	1,970	1,212	669	89
Indiana	4,675	2,645	1,258	937	450
Illinois	5,403	2,663	1,425	1,134	104
Michigan	3,254	1,716	845	843	28
Wisconsin	3,281	1,530	657	856	17
West North Central	9,029	4,355	2,366	1,788	201
Minnesota	2,298	1,150	682	326	142
Iowa	1,960	904	458	427	19
Missouri	1,873	972	529	422	21
North Dakota	436	218	74	135	9
South Dakota	228	86	45	41	----------
Nebraska	750	335	225	110	----------
Kansas	1,484	690	353	327	10
South Atlantic	9,389	4,176	2,198	1,825	153
Delaware	467	275	87	188	----------
Maryland	1,711	609	456	141	12
District of Columbia	760	376	241	91	44
Virginia	901	489	185	283	21
West Virginia	547	265	134	114	17
North Carolina	1,571	742	482	252	8
South Carolina	704	305	166	138	1
Georgia	974	351	148	170	33
Florida	1,754	764	299	448	17
East South Central	3,407	1,471	675	740	56
Kentucky	801	288	120	157	11
Tennessee	1,336	630	333	254	43
Alabama	704	272	137	133	2
Mississippi	566	281	85	196	----------
West South Central	7,569	3,740	1,944	1,462	334
Arkansas	362	172	70	101	1
Louisiana	1,496	736	406	329	1
Oklahoma	1,025	486	315	119	52
Texas	4,686	2,346	1,153	913	280
Mountain	5,296	2,495	1,295	1,092	108
Montana	317	128	80	48	----------
Idaho	178	89	47	36	6
Wyoming	246	123	34	42	47
Colorado	1,428	647	337	310	----------
New Mexico	598	292	177	105	10
Arizona	1,146	538	328	206	4
Utah	1,201	594	261	292	41
Nevada	182	84	31	53	----------
Pacific	9,697	4,588	2,468	2,078	42
Washington	2,007	955	500	449	6
Oregon	1,284	582	277	300	5
California	5,926	2,816	1,565	1,224	27
Alaska	72	36	15	21	----------
Hawaii	408	199	111	84	4
Outlying areas	103	60	37	23	----------

TABLE B–15.—*Average number of graduate students receiving stipends for part-time services as scientists or engineers per 100 full-time scientists or engineers in graduate institutions, by detailed field and function in which primarily engaged, January 1969* [a]

Field	Average, all functions [b]	Function [a]	
		Teaching	R&D
Average, all fields	52	45	91
Engineers	75	42	172
Aeronautical	81	44	136
Chemical	119	70	279
Civil	74	37	281
Electrical	76	49	134
Mechanical	67	39	195
Other engineers	66	32	154
Physical scientists	103	77	170
Chemists	121	101	175
Earth scientists	83	59	164
Physicists	98	64	188
Other physical scientists	77	37	109
Mathematicians	65	57	107
Life scientists	28	29	44
Agricultural	34	34	79
Biological	55	50	68
Medical	12	13	16
Psychologists	68	50	184
Social scientists	49	38	119
Economists	53	39	131
Sociologists	49	37	125
Political scientists	51	39	139
Historians	44	37	162
Other social scientists	51	42	93

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[a] Separate data are not shown for "other activities" because of the relatively small number of graduate students engaged in such activities. Also note that averages relate only to graduate institutions.

[b] Includes data for graduate students engaged in activities other than teaching and R&D.

TABLE B–16.—*Number of technicians employed in the sciences and engineering in universities and colleges, by function in which primarily employed, field of employment, and type of institution, January 1969*

Function and field of employment	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
All functions, total	48,497	44,538	1,758	869	1,332
Engineering and physical sciences	12,296	9,930	1,063	488	815
Life sciences	33,476	32,175	495	345	461
Social sciences	2,725	2,433	200	36	56
Research and development	33,825	33,101	557	91	76
Engineering and physical sciences	8,276	7,791	372	44	69
Life sciences	23,637	23,439	147	47	4
Social sciences	1,912	1,871	38		3
Other activities	14,672	11,437	1,201	778	1,256
Engineering and physical sciences	4,020	2,139	691	444	746
Life sciences	9,839	8,736	348	298	457
Social sciences	813	562	162	36	53

TABLE B-17.—*Number of technicians employed in the sciences and engineering in universities and colleges, by State and function in which primarily employed, January 1969*

State	Total	Function	
		R&D	Other activities
United States, total	48,497	33,825	14,672
New England	4,672	3,952	720
Maine	115	29	86
New Hampshire	173	147	26
Vermont	183	159	24
Massachusetts	3,164	2,885	279
Rhode Island	168	132	36
Connecticut	869	600	269
Middle Atlantic	10,118	7,258	2,860
New York	6,472	4,122	2,350
New Jersey	838	776	62
Pennsylvania	2,808	2,360	448
East North Central	7,838	4,529	3,309
Ohio	2,008	1,213	795
Indiana	648	486	162
Illinois	2,322	1,176	1,146
Michigan	1,608	1,229	379
Wisconsin	1,252	425	827
West North Central	3,605	2,372	1,233
Minnesota	599	290	309
Iowa	400	251	149
Missouri	790	557	233
North Dakota	125	52	73
South Dakota	72	58	14
Nebraska	664	438	226
Kansas	955	726	229
South Atlantic	6,883	4,413	2,470
Delaware	19	10	9
Maryland	1,587	1,026	561
District of Columbia	421	247	174
Virginia	1,412	524	888
West Virginia	150	101	49
North Carolina	1,142	871	271
South Carolina	257	147	110
Georgia	860	674	186
Florida	1,035	813	222
East South Central	3,119	2,186	933
Kentucky	1,012	734	278
Tennessee	1,183	832	351
Alabama	449	296	153
Mississippi	475	324	151
West South Central	3,356	2,112	1,244
Arkansas	298	108	190
Louisiana	673	634	39
Oklahoma	323	190	133
Texas	2,062	1,180	882
Mountain	2,109	1,620	489
Montana	116	107	9
Idaho	60	21	39
Wyoming	64	38	26
Colorado	506	408	98
New Mexico	533	422	111
Arizona	273	206	67
Utah	522	401	121
Nevada	35	17	18
Pacific	6,459	5,067	1,392
Washington	1,165	927	238
Oregon	439	282	157
California	4,645	3,697	948
Alaska	18	----------	18
Hawaii	192	161	31
Outlying areas	338	316	22

TABLE B-18.—*Current expenditures for research and instruction in the sciences and engineering in universities and colleges, by field of science and type of institution, 1968* [a]

(Dollars in thousands)

Field of science	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total	$6,861,830	$5,362,973	$681,163	$427,926	$389,768
Engineering	866,896	705,973	61,543	33,719	65,661
Physical and environmental sciences	1,314,655	967,182	167,910	107,083	72,480
Mathematics	418,891	244,086	70,035	47,006	57,764
Life sciences	2,683,096	2,382,098	125,608	96,391	78,999
Psychology	290,479	166,346	67,856	30,236	26,041
Social sciences	1,042,739	694,092	161,383	104,949	82,315
Other sciences, n.e.c.	245,074	203,196	26,828	8,542	6,508

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[a] Excludes current development expenditures totaling $95.4 million, for which the survey did not request a field-of-science distribution.

NOTE: N.e.c.—Not elsewhere classified.

TABLE B–19.—*Current and capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by type of expenditure and type of control, 1964, 1966, and 1968*

(Dollars in thousands)

Type of expenditure	1964	1966	1968
	All institutions		
Total	$3,959,170	$5,129,018	$6,957,279
Current R&D expenditures	1,594,895	2,084,684	2,598,708
Separately budgeted	1,272,436	1,714,684	2,148,708
Other [a]	322,459	370,000	450,000
Current expenditures for instruction [b]	1,834,783	2,377,337	3,287,844
Capital expenditures	529,492	666,997	1,070,727
	Public institutions		
Total	2,403,518	3,172,392	4,292,477
Current R&D expenditures	898,455	1,192,116	1,497,885
Separately budgeted	703,053	963,821	1,217,519
Other [a]	195,402	228,295	280,366
Current expenditures for instruction [b]	1,184,151	1,533,915	2,120,425
Capital expenditures	320,912	446,361	674,167
	Private institutions		
Total	1,555,652	1,956,626	2,664,802
Current R&D expenditures	696,440	892,568	1,100,823
Separately budgeted	569,383	750,863	931,189
Other [a]	127,057	141,705	169,634
Current expenditures for instruction [b]	650,632	843,422	1,167,419
Capital expenditures	208,580	220,636	396,560

[a] Includes estimates for departmental research and for other research activities for which most universities and colleges do not maintain separate records.

[b] Excludes departmental research expenditures, which are included in this table with current R&D expenditures.

TABLE B-20.—*Current and capital expenditures for research and instruction in the sciences and engineering in universities and colleges, by type of expenditure, field of science, and type of control, 1968* [a]

(Dollars in thousands)

Type of expenditure	Total	Engineering	Physical and environmental sciences	Mathematics	Life sciences	Psychology	Social sciences	Other sciences, n.e.c.
	All institutions							
Total	$6,861,830	$866,896	$1,314,655	$418,891	$2,683,096	$290,479	$1,042,739	$245,074
Current research expenditures	2,503,259	333,988	498,861	79,118	1,169,390	77,464	247,085	97,353
Separately budgeted	2,057,259	275,817	428,526	49,924	999,892	58,197	163,458	81,445
Other[b]	446,000	58,171	70,335	29,194	169,498	19,267	83,627	15,908
Current expenditures for instruction [c]	3,287,844	406,604	531,983	284,669	1,060,999	178,590	719,437	105,562
Capital expenditures	1,070,727	126,304	283,811	55,104	452,707	34,425	76,217	42,159
R&D and graduate instruction	528,097	48,622	121,209	21,473	273,912	19,710	26,822	16,349
Undergraduate instruction	542,630	77,682	162,602	33,631	178,795	14,715	49,395	25,810
	Public institutions							
Total	2,625,352	342,313	530,066	153,969	1,039,779	100,669	371,338	87,218
Current research expenditures	1,054,675	155,133	227,029	36,092	469,228	29,138	100,315	37,740
Separately budgeted	893,419	134,087	201,384	25,713	407,488	22,236	70,538	31,973
Other [b]	161,256	21,046	25,645	10,379	61,740	6,902	29,777	5,767
Current expenditures for instruction [c]	1,174,117	141,285	194,070	96,691	389,172	62,972	249,467	40,460
Capital expenditures	396,560	45,895	108,967	21,186	181,379	8,559	21,556	9,018
R&D and graduate instruction	197,775	20,186	45,780	8,297	109,848	2,274	8,489	2,901
Undergraduate instruction	198,785	25,709	63,187	12,889	71,531	6,285	13,067	6,117
	Private institutions							
Total	4,236,478	524,583	784,589	264,922	1,643,317	189,810	671,401	157,856
Current research expenditures	1,448,584	178,855	271,832	43,026	700,162	48,326	146,770	59,613
Separately budgeted	1,163,840	141,730	227,142	24,211	592,404	35,961	92,920	49,472
Other[b]	284,744	37,125	44,690	18,815	107,758	12,365	53,850	10,141
Current expenditures for instruction[c]	2,113,727	265,319	337,913	187,978	671,827	115,618	469,970	65,102
Capital expenditures	674,167	80,409	174,844	33,918	271,328	25,866	54,661	33,141
R&D and graduate instruction	330,322	28,436	75,429	13,176	164,064	17,436	18,333	13,448
Undergraduate instruction	343,845	51,973	99,415	20,742	107,264	8,430	36,328	19,693

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[a] Excludes current development expenditures totaling $95.4 million, for which the survey did not request a field-of-science distribution.

[b] Includes estimates for departmental research and for other research activities for which most universities and colleges do not maintain separate records.

[c] Excludes departmental research expenditures, which are included in this table with current R&D expenditures.

TABLE B–21.—*Current expenditures for research and development in universities and colleges, by source of funds, 1953–68* [a]

(Dollars in millions)

Year [b]	Total		Separately budgeted research and development financed by outside sponsors				Universities' and colleges' own funds		
	All R&D performance	Separately budgeted	Federal Government	State and local governments	Industry	Other nonprofit institutions	Total	Separately budgeted	Non-separately budgeted [c]
1953[d]	$334	$255	$138	$49	$19	$26	$103	$24	$79
1954	377	290	160	55	22	28	112	25	87
1955[d]	409	312	169	62	25	30	123	26	97
1956[d]	480	372	213	70	29	34	134	26	108
1957[d]	531	410	229	80	34	38	150	29	121
1958	592	456	254	90	39	42	167	31	136
1959[d]	682	526	306	100	39	47	190	34	156
1960[d]	825	646	405	112	40	52	216	37	179
1961[d]	969	763	500	125	40	58	246	40	206
1962[d]	1,143	904	613	139	40	66	285	46	239
1963[d]	1,359	1,081	760	155	41	73	330	52	278
1964	1,595	1,272	917	173	41	83	382	59	323
1965[d]	1,822	1,474	1,073	188	41	93	427	79	348
1966	2,085	1,715	1,261	204	42	108	470	100	370
1967[d]	2,329	1,921	1,409	214	48	119	539	131	408
1968	2,599	2,149	1,572	225	55	131	615	165	450

[a] Based on data obtained in NSF surveys covering R&D financing in 1954, 1958, 1964, 1966, and 1968.

[b] Academic year ending in the year shown; for example, 1953 refers to "academic year 1952–53."

[c] Includes estimates for departmental research and for other research activities for which most universities and colleges do not maintain separate records.

[d] Estimates derived from related information; no sector survey took place this year.

TABLE B-22.—*Current expenditures for research and development in universities and colleges, by character of work, 1953–68* [a]

(Dollars in millions)

Year [b]	Total	Basic research		Applied research		Development	
		Amount	Percent of total	Amount	Percent of total	Amount	Percent of total
1953[c]	$334	$173	51.8	$146	43.7	$15	4.5
1954	377	206	54.6	154	40.8	17	4.5
1955[c]	409	237	57.9	155	37.9	17	4.2
1956[c]	480	286	59.6	169	35.2	25	5.2
1957[c]	531	337	63.5	169	31.8	25	4.7
1958	592	390	65.9	175	29.6	27	4.6
1959[c]	682	468	68.6	186	27.3	28	4.1
1960[c]	825	576	69.8	215	26.1	34	4.1
1961[c]	969	701	72.3	233	24.0	35	3.6
1962[c]	1,143	850	74.4	253	22.1	40	3.5
1963[c]	1,359	1,036	76.2	283	20.8	40	2.9
1964	1,595	1,261	79.1	294	18.4	40	2.5
1965[c]	1,822	1,419	77.9	346	19.0	57	3.1
1966	2,085	1,601	76.8	400	19.2	84	4.0
1967[c]	2,329	1,795	77.1	444	19.1	90	3.9
1968	2,599	2,011	77.4	492	18.9	95	3.7

[a] Includes estimates for departmental research and for other research activities for which most universities and colleges do not maintain separate records.

[b] Academic year ending in the year shown; for example, 1953 refers to "academic year 1952–53."

[c] Estimates derived from related information; no sector survey took place this year.

TABLE B-23.—*Current expenditures for separately budgeted research and development in universities and colleges, by source of funds and type of institution, 1968*

(Dollars in thousands)

Source of funds	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total	$2,148,708	$2,092,214	$41,832	$9,481	$5,181
Federal Government	1,572,064	1,532,312	29,461	6,115	4,176
State governments	215,088	210,462	4,287	308	31
Local governments	10,387	10,047	320	20	----------
Foundations	71,625	67,527	2,637	827	634
Voluntary health agencies	23,639	23,509	116	14	----------
Industry	55,253	53,116	1,560	576	1
Institutions' own funds	164,530	159,964	2,898	1,342	326
Other sources	36,122	35,277	553	279	13

TABLE B-24.—*Current expenditures for separately budgeted research and development in universities and colleges, by State and source of funds, 1968*

(Dollars in thousands)

State	Total separately budgeted R&D	Federal Government	State governments	Local governments	Foundations	Voluntary health agencies	Industry	Institutions' own funds	Other sources
United States, total	$2,148,708	$1,572,064	$215,088	$10,387	$71,625	$23,639	$55,253	$164,530	$36,122
New England	253,386	223,491	5,208	129	9,055	1,820	5,295	6,925	1,463
Maine	2,886	1,385	954	34	3	3	111	395	1
New Hampshire	6,626	5,823	42	-----	253	-----	103	405	-----
Vermont	4,005	3,246	481	-----	49	28	161	21	19
Massachusetts	187,553	171,320	1,119	46	6,707	840	4,136	2,296	1,089
Rhode Island	14,751	10,920	939	42	465	99	314	1,776	196
Connecticut	37,565	30,797	1,673	7	1,578	850	470	2,032	158
Middle Atlantic	438,559	324,085	15,433	6,128	18,138	7,462	14,601	44,878	7,834
New York	265,598	202,292	6,112	5,230	11,062	6,130	5,743	24,526	4,503
New Jersey	47,487	34,135	4,626	6	1,177	220	1,787	4,736	800
Pennsylvania	125,474	87,658	4,695	892	5,899	1,112	7,071	15,616	2,531
East North Central	366,484	261,838	34,305	309	14,554	4,453	11,631	31,042	8,352
Ohio	68,092	47,465	6,420	149	1,602	684	3,767	6,765	1,240
Indiana	42,654	33,716	1,171	5	877	511	1,782	4,467	125
Illinois	109,934	83,762	10,769	143	5,595	1,323	1,461	3,799	3,082
Michigan	77,699	61,439	2,335	12	3,578	1,107	3,465	3,733	2,030
Wisconsin	68,105	35,456	13,610	-----	2,902	828	1,156	12,278	1,875
West North Central	163,946	107,004	28,674	72	3,538	1,269	3,781	15,939	3,669
Minnesota	32,879	27,161	2,380	-----	1,505	15	703	131	984
Iowa	24,881	15,206	7,235	53	628	296	853	598	12
Missouri	53,600	36,701	962	3	723	409	965	12,073	1,764
North Dakota	4,535	1,572	2,115	-----	72	22	174	547	33
South Dakota	9,670	3,916	4,678	5	28	7	264	209	563
Nebraska	12,969	5,809	5,836	10	476	256	328	100	154
Kansas	25,412	16,639	5,468	1	106	264	494	2,281	159
South Atlantic	257,337	178,038	31,967	2,016	8,403	2,965	6,141	23,187	4,620
Delaware	3,904	2,203	518	-----	416	-----	234	502	31
Maryland	54,348	42,611	3,944	44	1,965	825	646	2,700	1,613
District of Columbia	22,142	18,158	39	123	1,522	278	263	1,223	536
Virginia	19,140	13,176	3,056	4	800	221	757	1,042	84
West Virginia	6,994	6,034	327	16	117	36	94	310	60
North Carolina	55,628	42,737	7,195	23	2,123	701	955	1,484	410
South Carolina	6,840	3,835	1,992	38	127	32	238	526	52
Georgia	40,383	20,843	3,177	1,688	413	264	1,443	11,848	707
Florida	47,958	28,441	11,719	80	920	608	1,511	3,552	1,127
East South Central	71,256	47,019	11,039	554	1,217	775	1,789	8,017	846
Kentucky	12,873	8,756	694	6	187	209	194	2,466	361
Tennessee	27,281	19,253	5,560	217	540	183	414	830	284
Alabama	18,674	12,087	2,770	-----	355	257	727	2,375	103
Mississippi	12,428	6,923	2,015	331	135	126	454	2,346	98
West South Central	147,676	95,076	26,162	483	5,641	1,201	3,176	12,230	3,707
Arkansas	9,919	5,425	2,535	-----	57	59	277	409	1,157
Louisiana	31,686	19,802	8,547	35	1,208	329	427	642	696
Oklahoma	18,915	12,475	3,706	11	439	44	470	1,571	199
Texas	87,156	57,374	11,374	437	3,937	769	2,002	9,608	1,655
Mountain	107,746	76,696	16,151	377	2,085	943	3,586	6,571	1,337
Montana	6,706	3,722	1,896	-----	163	6	265	571	83
Idaho	4,995	1,899	2,443	-----	13	26	46	558	10
Wyoming	5,178	2,694	194	5	31	-----	687	1,264	303
Colorado	36,291	29,914	2,446	11	525	369	1,257	1,606	163
New Mexico	19,054	14,926	2,415	31	80	110	457	959	76
Arizona	11,742	7,345	3,452	67	310	131	213	62	162
Utah	18,286	13,336	1,748	79	591	301	633	1,271	327
Nevada	5,494	2,860	1,557	184	372	-----	28	280	213
Pacific	333,976	254,587	43,261	319	8,883	2,740	5,078	14,911	4,197
Washington	42,059	30,774	7,564	79	1,041	299	1,434	665	203
Oregon	25,227	18,152	3,855	91	810	270	251	225	1,573
California	245,959	193,368	27,657	139	6,770	2,166	3,281	10,234	2,344
Alaska	8,688	5,596	86	-----	155	-----	31	2,787	33
Hawaii	12,043	6,697	4,099	10	107	5	81	1,000	44
Outlying areas	8,342	4,230	2,888	-----	111	11	175	830	97

TABLE B-25.—*Current expenditures for separately budgeted research and development in universities and colleges, by State and source of funds, 1964, 1966, and 1968*

(Dollars in thousands)

State	Total separately budgeted R&D			Federal Government			Other sources		
	1964	1966	1968	1964	1966	1968	1964	1966	1968
United States, total	$1,272,436	$1,714,684	$2,148,708	$917,322	$1,261,034	$1,572,064	$355,114	$453,650	$576,644
New England	146,089	207,635	253,386	118,600	182,304	223,491	27,489	25,331	29,895
Maine	2,745	2,771	2,886	1,507	1,107	1,385	1,238	1,664	1,501
New Hampshire	5,143	6,769	6,626	4,434	6,312	5,823	709	457	803
Vermont	2,897	3,112	4,005	2,256	2,746	3,246	641	366	759
Massachusetts	99,390	152,133	187,553	81,443	136,518	171,320	17,947	15,615	16,233
Rhode Island	8,930	12,268	14,751	7,702	10,059	10,920	1,228	2,209	3,831
Connecticut	26,984	30,582	37,565	21,258	25,562	30,797	5,726	5,020	6,768
Middle Atlantic	257,065	343,243	438,559	198,518	263,590	324,085	58,547	79,653	114,474
New York	149,519	208,011	265,598	120,282	162,054	202,292	29,237	45,957	63,306
New Jersey	36,557	41,587	47,487	23,437	29,043	34,135	13,120	12,544	13,352
Pennsylvania	70,989	93,645	125,474	54,799	72,493	87,658	16,190	21,152	37,816
East North Central	230,735	304,710	366,484	172,334	226,644	261,838	58,401	78,066	104,646
Ohio	39,294	51,554	68,092	29,023	36,458	47,465	10,271	15,096	20,627
Indiana	26,500	38,104	42,654	19,306	29,952	33,716	7,194	8,152	8,938
Illinois	77,468	92,051	109,934	59,265	72,423	83,762	18,203	19,628	26,172
Michigan	52,209	70,426	77,699	42,505	54,893	61,439	9,704	15,533	16,260
Wisconsin	35,264	52,575	68,105	22,235	32,918	35,456	13,029	19,657	32,649
West North Central	96,542	129,703	163,946	57,846	78,341	107,004	38,696	51,362	56,942
Minnesota	23,368	29,116	32,879	17,090	21,985	27,161	6,278	7,131	5,718
Iowa	17,780	19,735	24,881	11,220	13,130	15,206	6,560	6,605	9,675
Missouri	27,264	42,218	53,600	14,944	23,517	36,701	12,320	18,701	16,899
North Dakota	3,615	3,762	4,535	1,888	1,419	1,572	1,727	2,343	2,963
South Dakota	3,642	8,783	9,670	2,150	3,405	3,916	1,492	5,378	5,754
Nebraska	6,950	8,240	12,969	2,997	4,365	5,809	3,953	3,875	7,160
Kansas	13,923	17,849	25,412	7,557	10,520	16,639	6,366	7,329	8,773
South Atlantic	146,227	200,164	257,337	99,208	137,494	178,038	47,019	62,670	79,299
Delaware	2,914	3,161	3,904	1,566	1,847	2,203	1,348	1,314	1,701
Maryland	36,009	43,496	54,348	28,712	35,114	42,611	7,297	8,382	11,737
District of Columbia	12,797	19,767	22,142	11,241	16,432	18,158	1,556	3,335	3,984
Virginia	14,083	17,857	19,140	9,273	12,122	13,176	4,810	5,735	5,964
West Virginia	3,466	5,629	6,994	1,921	3,817	6,034	1,545	1,812	960
North Carolina	27,116	39,805	55,628	18,169	27,844	42,737	8,947	11,961	12,891
South Carolina	4,680	6,075	6,840	2,640	3,642	3,835	2,040	2,433	3,005
Georgia	18,083	28,071	40,383	9,911	16,074	20,843	8,172	11,997	19,540
Florida	27,079	36,303	47,958	15,775	20,602	28,441	11,304	15,701	19,517
East South Central	44,994	55,848	71,256	28,623	37,599	47,019	16,371	18,249	24,237
Kentucky	8,706	10,915	12,873	4,833	7,145	8,756	3,873	3,770	4,117
Tennessee	18,574	21,966	27,281	12,964	16,538	19,253	5,610	5,428	8,028
Alabama	11,027	13,387	18,674	6,868	8,286	12,087	4,159	5,101	6,587
Mississippi	6,687	9,580	12,428	3,958	5,630	6,923	2,729	3,950	5,505
West South Central	79,258	107,045	147,676	49,838	71,432	95,076	29,420	35,613	52,600
Arkansas	6,636	8,488	9,919	3,358	4,872	5,425	3,278	3,616	4,494
Louisiana	18,238	22,195	31,686	11,681	14,604	19,802	6,557	7,591	11,884
Oklahoma	10,754	13,713	18,915	6,603	8,208	12,475	4,151	5,505	6,440
Texas	43,630	62,649	87,156	28,196	43,748	57,374	15,434	18,901	29,782
Mountain	69,190	93,274	107,746	47,039	62,043	76,696	22,151	31,231	31,050
Montana	3,788	5,528	6,706	1,621	2,478	3,722	2,167	3,050	2,984
Idaho	3,847	4,794	4,995	1,486	1,898	1,899	2,361	2,896	3,096
Wyoming	3,085	4,418	5,178	999	1,728	2,694	2,086	2,690	2,484
Colorado	20,268	26,799	36,291	15,863	20,653	29,914	4,405	6,146	6,377
New Mexico	14,603	16,039	19,054	11,449	12,497	14,926	3,154	3,542	4,128
Arizona	9,881	14,392	11,742	6,638	8,443	7,345	3,243	5,949	4,397
Utah	11,111	16,555	18,286	7,833	12,209	13,336	3,278	4,346	4,950
Nevada	2,607	4,749	5,494	1,150	2,137	2,860	1,457	2,612	2,634
Pacific	196,505	265,851	333,976	141,839	198,030	254,587	54,666	67,821	79,389
Washington	24,316	30,904	42,059	16,318	21,765	30,774	7,998	9,139	11,285
Oregon	15,830	20,294	25,227	10,775	14,010	18,152	5,055	6,284	7,075
California	144,813	198,925	245,959	108,270	151,613	193,368	36,543	47,312	52,591
Alaska	4,205	7,109	8,688	2,299	5,027	5,596	1,906	2,082	3,092
Hawaii	7,341	8,619	12,043	4,177	5,615	6,697	3,164	3,004	5,346
Outlying areas	5,831	7,211	8,342	3,477	3,557	4,230	2,354	3,654	4,112

TABLE B-26.—*Current expenditures for separately budgeted research in universities and colleges, by field of science and source of funds, 1964, 1966, and 1968* [a]

(Dollars in thousands)

Field of science and source of funds	1964	1966	1968
Total	$1,234,832	$1,634,390	$2,057,259
Federal Government	894,579	1,202,320	1,504,359
Other sources	340,253	432,070	552,900
Engineering	156,626	228,973	275,817
Federal Government	124,912	183,020	217,358
Other sources	31,714	45,953	58,459
Physical and environmental sciences	265,179	344,783	428,526
Federal Government	228,106	295,252	353,751
Other sources	37,073	49,531	74,775
Mathematics	28,347	35,955	49,924
Federal Government	25,118	29,657	39,941
Other sources	3,229	6,298	9,983
Life sciences	660,125	840,533	999,892
Federal Government	443,389	577,006	703,125
Other sources	216,736	263,527	296,767
Psychology	31,825	39,232	58,197
Federal Government	26,993	33,482	47,458
Other sources	4,332	5,750	10,739
Social sciences	78,872	105,379	163,458
Federal Government	40,961	60,047	98,612
Other sources	37,911	45,332	64,846
Other sciences, n.e.c.	14,358	39,535	81,445
Federal Government	5,100	23,856	44,114
Other sources	9,258	15,679	37,331

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[a] Excludes current development expenditures, for which the surveys did not request a field-of-science distribution.

TABLE B-27.—*Current expenditures for separately budgeted research in universities and colleges, by field of science, source of funds, and type of institution, 1968* [a]

(Dollars in thousands)

Field of science and source of funds	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total	$2,057,259	$2,006,131	$38,109	$8,932	$4,087
Federal Government	1,504,359	1,468,124	27,210	5,728	3,297
Other sources	552,900	538,007	10,899	3,204	790
Engineering	275,817	269,650	4,774	868	525
Federal Government	217,358	213,819	2,774	329	436
Other sources	58,459	55,831	2,000	539	89
Physical sciences	312,249	300,491	8,487	3,073	198
Federal Government	267,862	259,232	6,256	2,222	152
Other sources	44,387	41,259	2,231	851	46
Environmental sciences	116,277	111,221	2,297	329	2,430
Federal Government	85,889	81,617	2,059	169	2,044
Other sources	30,388	29,604	238	160	386
Mathematics	49,924	48,633	916	335	40
Federal Government	39,941	39,000	677	241	23
Other sources	9,983	9,633	239	94	17
Life sciences	999,892	988,585	8,326	2,565	416
Federal Government	703,125	694,590	6,603	1,652	280
Other sources	296,767	293,995	1,723	913	136
Psychology	58,197	52,849	4,717	421	210
Federal Government	47,458	43,540	3,440	294	184
Other sources	10,739	9,309	1,277	127	26
Social sciences	163,458	155,679	6,652	1,063	64
Federal Government	98,612	93,349	4,524	698	41
Other sources	64,846	62,330	2,128	365	23
Other sciences, n.e.c.	81,445	79,023	1,940	278	204
Federal Government	44,114	42,977	877	123	137
Other sources	37,331	36,046	1,063	155	67

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[a] Excludes current development expenditures totaling $91.4 million, for which the survey did not request a field-of-science distribution.

TABLE B–28.—*Current direct expenditures for instruction and departmental research in the sciences and engineering in universities and colleges, by field of science and type of institution, 1968*

(Dollars in thousands)

Field of science	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total	$2,688,142	$1,848,861	$377,971	$229,236	$232,074
Engineering	334,197	252,070	34,148	11,843	36,136
Physical and environmental sciences	432,679	265,008	78,698	48,691	40,282
Mathematics	228,712	115,941	46,072	29,620	37,079
Life sciences	876,708	728,376	60,032	44,529	43,771
Psychology	144,142	72,689	33,749	19,986	17,718
Social sciences	584,301	349,986	109,393	70,644	54,278
Other sciences, n.e.c	87,403	64,791	15,879	3,923	2,810

TABLE B-29.—*Current direct expenditures for instruction and departmental research in the sciences and engineering in universities and colleges, by State and field of science, 1968*

(Dollars in thousands)

State	Total	Engineering	Physical and environmental sciences	Mathematics	Life sciences	Psychology	Social sciences	Other sciences
United States, total	$2,688,142	$334,197	$432,679	$228,712	$876,708	$144,142	$584,301	$87,403
New England	247,311	34,840	41,472	17,985	74,896	12,153	58,171	7,794
Maine	7,844	1,057	1,465	937	1,583	564	2,060	178
New Hampshire	11,022	1,447	2,490	1,126	3,500	627	1,677	155
Vermont	12,607	902	1,255	641	4,896	482	1,821	2,610
Massachusetts	145,774	23,904	25,610	9,649	45,448	7,002	31,046	3,115
Rhode Island	11,366	1,426	2,210	1,309	3,140	686	2,355	240
Connecticut	58,698	6,104	8,442	4,323	16,329	2,792	19,212	1,496
Middle Atlantic	501,646	64,351	80,008	43,465	158,826	28,686	104,738	21,572
New York	282,050	35,427	46,069	22,801	94,264	17,518	56,705	9,266
New Jersey	55,038	6,222	7,925	6,127	13,508	2,728	13,681	4,847
Pennsylvania	164,558	22,702	26,014	14,537	51,054	8,440	34,352	7,459
East North Central	508,553	64,437	86,390	44,155	146,720	29,241	122,510	15,100
Ohio	113,373	15,569	22,494	9,974	33,178	7,057	22,538	2,563
Indiana	68,046	10,465	11,720	6,294	18,025	3,207	15,888	2,447
Illinois	140,297	14,022	22,620	11,597	43,883	7,283	34,041	6,851
Michigan	116,784	16,918	18,041	10,355	35,451	6,859	26,044	3,116
Wisconsin	70,053	7,463	11,515	5,935	16,183	4,835	23,999	123
West North Central	242,222	23,238	34,853	18,404	91,929	12,040	52,921	8,837
Minnesota	56,642	3,723	8,774	4,491	19,009	3,520	14,018	3,107
Iowa	47,051	5,410	6,507	3,575	15,339	2,204	12,627	1,389
Missouri	58,228	6,000	7,985	4,795	27,994	2,549	8,364	541
North Dakota	14,702	1,406	1,732	899	3,798	470	5,233	1,164
South Dakota	9,486	1,332	2,078	860	3,039	415	1,456	306
Nebraska	23,697	1,605	2,868	1,231	14,181	846	2,471	495
Kansas	32,416	3,762	4,909	2,553	8,569	2,036	8,752	1,835
South Atlantic	327,955	40,809	51,327	30,322	108,119	16,680	72,509	8,189
Delaware	7,775	1,095	1,104	567	1,903	311	2,791	4
Maryland	41,967	4,781	7,803	4,979	14,385	2,217	5,975	1,827
District of Columbia	29,666	3,390	3,423	1,883	14,340	896	5,363	371
Virginia	38,968	6,683	6,058	3,723	12,110	2,136	7,774	484
West Virginia	14,607	1,329	2,557	1,330	4,157	826	4,105	303
North Carolina	67,592	5,433	8,788	5,532	28,567	3,629	11,783	3,860
South Carolina	17,466	4,074	3,199	1,898	4,528	787	2,894	86
Georgia	49,875	6,970	7,789	3,687	13,156	2,225	15,198	850
Florida	60,039	7,054	10,606	6,723	14,973	3,653	16,626	404
East South Central	132,159	14,277	17,058	10,530	55,514	6,050	25,617	3,113
Kentucky	38,556	2,572	3,703	2,242	21,262	1,610	5,611	1,556
Tennessee	42,724	4,860	6,503	3,588	17,842	2,294	6,542	1,095
Alabama	35,424	4,548	4,749	3,274	11,088	1,320	10,299	146
Mississippi	15,455	2,297	2,103	1,426	5,322	826	3,165	316
West South Central	181,893	23,357	29,018	18,607	56,204	9,529	36,642	8,536
Arkansas	11,687	1,338	1,922	1,029	3,574	736	2,032	1,056
Louisiana	33,701	3,921	6,310	3,645	11,849	1,475	6,312	189
Oklahoma	22,518	4,339	3,424	2,467	6,421	1,220	4,488	159
Texas	113,987	13,759	17,362	11,466	34,360	6,098	23,810	7,132
Mountain	137,480	17,839	23,135	11,030	45,432	7,644	26,896	5,504
Montana	8,173	972	1,325	873	3,067	351	1,225	360
Idaho	5,961	1,044	1,349	581	1,483	364	1,125	15
Wyoming	7,563	1,089	1,681	493	1,039	795	651	1,815
Colorado	44,656	3,110	6,461	3,629	18,698	2,794	8,236	1,728
New Mexico	17,336	3,023	2,985	1,352	6,875	729	1,684	688
Arizona	26,805	5,089	4,819	1,898	5,097	1,281	8,568	53
Utah	20,754	2,859	3,421	1,678	8,097	999	3,294	406
Nevada	6,232	653	1,094	526	1,076	331	2,113	439
Pacific	389,776	48,966	67,000	33,277	128,269	21,679	82,026	8,559
Washington	53,151	6,043	7,913	4,540	21,120	2,887	8,928	1,720
Oregon	28,327	2,819	5,591	3,166	8,462	1,533	5,678	1,078
California	295,592	38,973	51,067	24,875	94,493	16,698	64,045	5,441
Alaska	2,322	315	217	146	251	120	1,121	152
Hawaii	10,384	816	2,212	550	3,943	441	2,254	168
Outlying areas	19,147	2,083	2,418	937	10,799	440	2,271	199

TABLE B–30.—*Capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by type of institution, source of funds, and purpose, 1968*

(Dollars in thousands)

Type of institution	Total capital expenditures			R&D and graduate instruction			Undergraduate instruction		
	Total	Federal Government	Other sources	Total	Federal Government	Other sources	Total	Federal Government	Other sources
Total	$1,070,727	$340,447	$730,280	$528,097	$201,998	$326,099	$542,630	$138,449	$404,181
Doctorate	759,322	263,355	495,967	473,540	189,336	284,204	285,782	74,019	211,763
Master's	144,348	35,264	109,084	46,038	11,147	34,891	98,310	24,117	74,193
Bachelor's	97,950	24,966	72,984	8,208	1,451	6,757	89,742	23,515	66,227
No science degree	69,107	16,862	52,245	311	64	247	68,796	16,798	51,998

TABLE B–31.—*Capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by State, source of funds, and purpose, 1968*

(Dollars in thousands)

State	All sources			Federal Government			Other sources		
	Total	R&D and graduate instruction	Under-graduate instruction	Total	R&D and graduate instruction	Under-graduate instruction	Total	R&D and graduate instruction	Under-graduate instruction
United States, total	$1,070,727	$528,097	$542,630	$340,447	$201,998	$138,449	$730,280	$326,099	$404,181
New England	73,228	33,127	40,101	18,646	10,055	8,591	54,582	23,072	31,510
Maine	1,507	26	1,481	512	10	502	995	16	979
New Hampshire	2,654	614	2,040	628	270	358	2,026	344	1,682
Vermont	2,967	366	2,601	1,190	263	927	1,777	103	1,674
Massachusetts	43,728	20,604	23,124	10,234	6,158	4,076	33,494	14,446	19,048
Rhode Island	6,212	3,485	2,727	2,336	1,242	1,094	3,876	2,243	1,633
Connecticut	16,160	8,032	8,128	3,746	2,112	1,634	12,414	5,920	6,494
Middle Atlantic	250,403	128,618	121,785	71,397	45,036	26,361	179,006	83,582	95,424
New York	110,071	54,508	55,563	31,482	19,455	12,027	78,589	35,053	43,536
New Jersey	32,890	15,105	17,785	12,702	7,538	5,164	20,188	7,567	12,621
Pennsylvania	107,442	59,005	48,437	27,213	18,043	9,170	80,229	40,962	39,267
East North Central	209,904	109,394	100,510	62,203	38,879	23,324	147,701	70,515	77,186
Ohio	46,160	17,931	28,229	11,600	5,464	6,136	34,560	12,467	22,093
Indiana	28,097	19,658	8,439	11,125	8,365	2,760	16,972	11,293	5,679
Illinois	64,852	38,959	25,893	15,741	11,593	4,148	49,111	27,366	21,745
Michigan	53,503	26,489	27,014	17,720	10,853	6,867	35,783	15,636	20,147
Wisconsin	17,292	6,357	10,935	6,017	2,604	3,413	11,275	3,753	7,522
West North Central	75,377	39,993	35,384	29,687	17,852	11,835	45,690	22,141	23,549
Minnesota	18,893	8,972	9,921	8,008	4,707	3,301	10,885	4,265	6,620
Iowa	13,242	6,765	6,477	4,223	2,394	1,829	9,019	4,371	4,648
Missouri	23,860	17,171	6,689	10,546	7,596	2,950	13,314	9,575	3,739
North Dakota	2,749	750	1,999	848	391	457	1,901	359	1,542
South Dakota	2,394	1,599	795	834	644	190	1,560	955	605
Nebraska	7,959	3,272	4,687	3,280	1,181	2,099	4,679	2,091	2,588
Kansas	6,280	1,464	4,816	1,948	939	1,009	4,332	525	3,807
South Atlantic	129,746	60,521	69,225	44,707	26,969	17,738	85,039	33,552	51,487
Delaware	4,588	789	3,799	1,316	273	1,043	3,272	516	2,756
Maryland	16,887	7,792	9,095	6,043	4,396	1,647	10,844	3,396	7,448
District of Columbia	11,725	5,296	6,429	5,563	2,885	2,678	6,162	2,411	3,751
Virginia	12,597	3,397	9,200	4,871	2,101	2,770	7,726	1,296	6,430
West Virginia	3,822	1,664	2,158	1,284	510	774	2,538	1,154	1,384
North Carolina	30,789	19,915	10,874	12,453	9,827	2,626	18,336	10,088	8,248
South Carolina	5,962	1,691	4,271	2,033	599	1,434	3,929	1,092	2,837
Georgia	10,612	6,696	3,916	3,097	2,373	724	7,515	4,323	3,192
Florida	32,764	13,281	19,483	8,047	4,005	4,042	24,717	9,276	15,441
East South Central	45,736	18,932	26,804	10,582	5,961	4,621	35,154	12,971	22,183
Kentucky	14,770	6,231	8,539	3,017	1,811	1,206	11,753	4,420	7,333
Tennessee	16,164	4,917	11,247	3,378	1,289	2,089	12,786	3,628	9,158
Alabama	10,209	6,439	3,770	3,023	2,225	798	7,186	4,214	2,972
Mississippi	4,593	1,345	3,248	1,164	636	528	3,429	709	2,720
West South Central	88,161	38,120	50,041	36,296	17,672	18,624	51,865	20,448	31,417
Arkansas	4,757	740	4,017	2,235	586	1,649	2,522	154	2,368
Louisiana	15,168	6,097	9,071	5,291	2,293	2,998	9,877	3,804	6,073
Oklahoma	7,538	3,376	4,162	1,396	764	632	6,142	2,612	3,530
Texas	60,698	27,907	32,791	27,374	14,029	13,345	33,324	13,878	19,446
Mountain	61,661	26,550	35,111	19,822	9,623	10,199	41,839	16,927	24,912
Montana	778	478	300	307	241	66	471	237	234
Idaho	1,781	1,125	656	393	233	160	1,388	892	496
Wyoming	3,518	868	2,650	1,006	272	734	2,512	596	1,916
Colorado	26,726	8,799	17,927	7,339	2,084	5,255	19,387	6,715	12,672
New Mexico	6,562	4,629	1,933	2,293	1,754	539	4,269	2,875	1,394
Arizona	12,646	4,513	8,133	4,521	2,128	2,393	8,125	2,385	5,740
Utah	8,479	5,610	2,869	3,633	2,718	915	4,846	2,892	1,954
Nevada	1,171	528	643	330	193	137	841	335	506
Pacific	133,823	70,948	62,875	45,918	29,224	16,694	87,905	41,724	46,181
Washington	15,239	7,973	7,266	4,759	3,114	1,645	10,480	4,859	5,621
Oregon	12,164	7,060	5,104	5,308	4,296	1,012	6,856	2,764	4,092
California	99,451	50,503	48,948	32,499	18,593	13,906	66,952	31,910	35,042
Alaska	977	860	117	403	374	29	574	486	88
Hawaii	5,992	4,552	1,440	2,949	2,847	102	3,043	1,705	1,338
Outlying areas	2,688	1,894	794	1,189	727	462	1,499	1,167	332

TABLE B–32.—*Capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by State and source of funds, 1964, 1966, and 1968*

(Dollars in thousands)

State	Total capital expenditures			Federal Government			Other sources		
	1964	1966	1968	1964	1966	1968	1964	1966	1968
United States, total	$529,492	$666,997	$1,070,727	$134,439	$212,397	$340,447	$395,053	$454,600	$730,280
New England	39,553	45,166	73,228	13,164	14,555	18,646	26,389	30,611	54,582
Maine	696	880	1,507	192	368	512	504	512	995
New Hampshire	3,046	3,138	2,654	1,483	547	628	1,563	2,591	2,026
Vermont	667	916	2,967	489	553	1,190	178	363	1,777
Massachusetts	21,607	24,783	43,728	6,879	8,522	10,234	14,728	16,261	33,494
Rhode Island	1,596	1,810	6,212	583	328	2,336	1,013	1,482	3,876
Connecticut	11,941	13,639	16,160	3,538	4,237	3,746	8,403	9,402	12,414
Middle Atlantic	107,631	136,070	250,403	25,689	42,432	71,397	81,942	93,638	179,006
New York	79,323	96,921	110,071	15,507	28,261	31,482	63,816	68,660	78,589
New Jersey	10,072	10,848	32,890	2,731	4,064	12,702	7,341	6,784	20,188
Pennsylvania	18,236	28,301	107,442	7,451	10,107	27,213	10,785	18,194	80,229
East North Central	108,781	109,549	209,904	29,449	33,878	62,203	79,332	75,671	147,701
Ohio	13,225	20,769	46,160	3,960	5,868	11,600	9,265	14,901	34,560
Indiana	11,079	14,893	28,097	3,198	6,407	11,125	7,881	8,486	16,972
Illinois	42,072	28,813	64,852	8,737	9,443	15,741	33,335	19,370	49,111
Michigan	23,734	25,568	53,503	8,701	7,831	17,720	15,033	17,737	35,783
Wisconsin	18,671	19,506	17,292	4,853	4,329	6,017	13,818	15,177	11,275
West North Central	43,987	54,398	75,377	9,783	18,646	29,687	34,204	35,752	45,690
Minnesota	11,441	13,182	18,893	3,690	5,341	8,008	7,751	7,841	10,885
Iowa	12,202	12,728	13,242	1,851	2,734	4,223	10,351	9,994	9,019
Missouri	7,344	10,874	23,860	1,728	5,358	10,546	5,616	5,516	13,314
North Dakota	1,006	954	2,749	227	246	848	779	708	1,901
South Dakota	1,581	2,666	2,394	247	1,070	834	1,334	1,596	1,560
Nebraska	3,609	8,498	7,959	751	2,146	3,280	2,858	6,352	4,679
Kansas	6,804	5,496	6,280	1,289	1,751	1,948	5,515	3,745	4,332
South Atlantic	43,886	78,012	129,746	12,694	24,941	44,707	31,192	53,071	85,039
Delaware	1,957	767	4,588	219	498	1,316	1,738	269	3,272
Maryland	6,855	17,085	16,887	2,307	6,552	6,043	4,548	10,533	10,844
District of Columbia	3,757	6,319	11,725	1,685	2,285	5,563	2,072	4,034	6,162
Virginia	4,374	7,631	12,597	663	1,674	4,871	3,711	5,957	7,726
West Virginia	4,012	2,885	3,822	1,515	986	1,284	2,497	1,899	2,538
North Carolina	7,873	15,567	30,789	1,762	4,362	12,453	6,111	11,205	18,336
South Carolina	1,134	4,069	5,962	346	1,054	2,033	788	3,015	3,929
Georgia	4,316	4,316	10,612	1,478	1,422	3,097	2,838	2,894	7,515
Florida	9,608	19,373	32,764	2,719	6,108	8,047	6,889	13,265	24,717
East South Central	27,956	27,283	45,736	8,060	8,872	10,582	19,896	18,411	35,154
Kentucky	2,439	5,086	14,770	781	1,852	3,017	1,658	3,234	11,753
Tennessee	11,702	8,403	16,164	3,394	2,588	3,378	8,308	5,815	12,786
Alabama	5,901	10,046	10,209	1,822	2,679	3,023	4,079	7,367	7,186
Mississippi	7,914	3,748	4,593	2,063	1,753	1,164	5,851	1,995	3,429
West South Central	33,797	42,389	88,161	10,435	15,895	36,296	23,362	26,494	51,865
Arkansas	1,721	2,217	4,757	870	887	2,235	851	1,330	2,522
Louisiana	5,332	6,120	15,168	2,847	1,730	5,291	2,485	4,390	9,877
Oklahoma	9,295	2,822	7,538	1,132	708	1,396	8,163	2,114	6,142
Texas	17,449	31,230	60,698	5,586	12,570	27,374	11,863	18,660	33,324
Mountain	18,274	43,494	61,661	5,474	12,965	19,822	12,800	30,529	41,839
Montana	627	1,846	778	228	459	307	399	1,387	471
Idaho	3,310	937	1,781	81	206	393	3,229	731	1,388
Wyoming	166	540	3,518	74	195	1,006	92	345	2,512
Colorado	6,343	12,461	26,726	1,471	4,885	7,339	4,872	7,576	19,387
New Mexico	1,364	9,084	6,562	818	1,414	2,293	546	7,670	4,269
Arizona	2,140	14,730	12,646	721	4,123	4,521	1,419	10,607	8,125
Utah	3,916	3,150	8,479	1,849	1,259	3,633	2,067	1,891	4,846
Nevada	408	746	1,171	232	424	330	176	322	841
Pacific	104,937	129,218	133,823	19,396	39,694	45,918	85,541	89,524	87,905
Washington	8,756	11,369	15,239	2,778	3,298	4,759	5,978	8,071	10,480
Oregon	4,082	7,605	12,164	2,407	3,561	5,308	1,675	4,044	6,856
California	88,948	106,921	99,451	12,153	30,843	32,499	76,795	76,078	66,952
Alaska	982	1,935	977	352	1,810	403	630	125	574
Hawaii	2,169	1,388	5,992	1,706	182	2,949	463	1,206	3,043
Outlying areas	690	1,418	2,688	295	519	1,189	395	899	1,499

TABLE B–33.—*Capital expenditures for research, development, and instruction in the sciences and engineering in universities and colleges, by field of science and type of institution, 1968*

(Dollars in thousands)

Field of science	Total	Institutions granting—			
		Doctorate	Master's	Bachelor's	No science degree
Total	$1,070,727	$759,322	$144,348	$97,950	$69,107
Engineering	126,304	82,537	11,722	16,224	15,821
Physical and environmental sciences	283,811	180,260	53,242	35,490	14,819
Mathematics	55,104	34,324	8,412	5,228	7,140
Life sciences	452,707	364,396	37,996	31,465	18,850
Psychology	34,425	12,270	18,611	1,850	1,694
Social sciences	76,217	52,559	10,435	4,916	8,307
Other sciences, n.e.c	42,159	32,976	3,930	2,777	2,476

TABLE B–34.—*Percent distribution of selected financial, employment, and educational characteristics of scientific and engineering activities of universities and colleges, by institutional group ranked on the basis of separately budgeted R&D expenditures, 1968*

(Dollars in thousands)

Institutional group ranked according to amount of separately budgeted R&D expenditures	Separately budgeted R&D expenditures			Current direct expenditures for instruction and departmental research	Capital expenditures for research, development, and instruction			Scientists and engineers	Degrees granted in the sciences and engineering [a]	
	Total	Federal Government	Other sources		Total	Federal Government	Other sources		Total	Ph. D. or Sc. D.
Total, all institutions	$2,148,708	$1,572,064	$576,644	$2,688,142	$1,070,727	$340,447	$730,280	253,536	253,550	12,759
	Percent distribution									
First 10	24.9	26.8	19.7	11.1	8.6	10.1	7.9	11.6	9.1	25.7
Second 10	14.8	16.1	11.3	8.8	8.0	10.2	7.1	8.8	8.1	13.8
Third 10	10.5	9.1	14.2	5.8	7.9	7.6	8.1	5.9	5.2	9.1
Fourth 10	8.3	8.7	7.3	5.2	7.2	8.5	6.6	5.4	5.4	10.7
Fifth 10	6.7	6.7	6.6	4.0	3.3	4.7	2.6	3.5	3.3	7.9
Sixth 10	5.5	4.7	7.9	5.1	4.5	6.6	3.6	3.8	4.1	6.1
Seventh 10	4.7	4.6	4.9	3.7	4.0	5.4	3.4	3.7	3.3	5.0
Eighth 10	4.1	3.7	5.3	3.0	2.3	1.9	2.5	3.3	2.9	4.0
Ninth 10	3.4	2.9	4.8	2.4	2.1	1.9	2.3	3.0	2.6	3.0
Tenth 10	2.7	2.9	2.1	2.0	2.8	3.6	2.5	1.9	1.9	2.4
First 100	85.7	86.3	84.1	51.2	50.9	60.5	46.4	50.9	45.9	87.5
All other institutions	14.3	13.7	15.9	48.8	49.1	39.5	53.6	49.1	54.1	12.5

[a] Excludes first-professional doctorates in medical and health-related fields (M.D., D.D.S., etc.).

APPENDIX B

Reproduction of Survey Form

(Includes aggregate data from 2,175 universities and colleges and
101 medical schools, but excludes 36 university-administered FFRDC's)

NSF FORM 411, November 1968
Supersedes NSF Form 9D–7a

Budget Bureau No. 99–S68004
Approval expires September 30, 1970

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC ACTIVITIES OF INSTITUTIONS OF HIGHER EDUCATION, 1967–68

Name and address of institution:

All completed forms and correspondence covering this survey should be addressed to:

Universities and Nonprofit
Institutions Studies Group
National Science Foundation
Washington, D.C. 20550

The survey questionnaire requests two types of information on the scientific and engineering activities of your institution: Part I, employment of professional and technical personnel, and Part II, current and capital expenditures for research, development, and instruction.

Please read the enclosed instructions before completing this form. Where exact data are not available, estimates are acceptable. Enter "none," where appropriate, rather than leave an item blank.

Each institution receiving this form is requested to complete the original copy and return it in the enclosed self-addressed envelope to the National Science Foundation within 30 days.

The data requested in this questionnaire will be published as statistical totals or aggregates for all institutions or for selected groups of institutions. In certain instances, however, the National Science Foundation may wish to publish selected survey data with the institution identified. Please indicate below the number of any item that should not be published with institutional identification:

____

In addition to completing this questionnaire for the institution as a whole, a limited number of institutions are requested to report data for certain of their organizational units. Separate blue questionnaires (NSF Form 412) should be used to report data for the following organizational units:

Federally Funded Research and Development Centers, as designated by Federal agencies,
Schools of medicine

If your institution has separately organized units as defined on page 2 of the Instructions and has not received the appropriate forms, such forms will be furnished upon request.

This survey is intended to include institutions in the United States and its Territories. Exclude financial and personnel data related specifically to scientific activities carried out by organizational units of the institution located abroad.

Although Form 411 is intended to be used to report data for the institution as a whole, it is recognized that some institutions may find it convenient to submit separate reports for branches or other organizational units. If your institution prefers to submit separate reports for branches or other organizational units rather than a single report covering the entire institution, list below all branches or other organizational units of your institution which have been excluded from this report and for which separate reports are being submitted:

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PART I—PERSONNEL DATA

(Includes items 1 to 6 of the survey questionnaire)

Personnel data are to be reported as of January 1969 or as close as possible thereto.

SECTION A
NUMBER OF SCIENTISTS AND ENGINEERS

(NOTE: Figures on graduate students engaged part time as scientists and engineers should be reported in Section B.)

Item 1. **Full-time scientists and engineers, by field and function in which *primarily* employed; and total full-time equivalents, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	*0110*	21,431	15,946	4,528	957
(1) Aeronautical engineers	*0111*	1,197	785	397	15
(2) Chemical engineers	*0112*	1,501	1,118	312	71
(3) Civil engineers	*0113*	3,271	2,691	417	163
(4) Electrical engineers	*0114*	5,637	4,082	1,401	154
(5) Mechanical engineers	*0115*	4,058	3,342	561	155
(6) Other engineers	*0116*	5,767	3,928	1,440	399
b. Physical scientists (total)	*0120*	30,029	23,003	6,329	697
(1) Chemists	*0121*	12,787	10,025	2,488	274
(2) Earth scientists	*0122*	4,935	3,906	888	141
(3) Physicists	*0123*	10,484	8,082	2,176	226
(4) Other physical scientists	*0124*	1,823	990	777	56
c. Mathematicians (total)	*0130*	18,407	16,515	1,509	383
d. Life scientists (total)	*0140*	79,148	37,968	22,534	18,646
(1) Agricultural scientists	*0141*	13,963	2,963	4,484	6,516
(2) Biological scientists	*0142*	25,672	17,947	6,717	1,008
(3) Medical scientists	*0143*	39,513	17,058	11,333	11,122
e. Psychologists (total)	*0150*	11,576	9,581	1,085	910
f. Social scientists (total)	*0160*	43,450	37,324	3,377	2,749
(1) Economists	*0161*	8,630	7,205	953	472
(2) Sociologists	*0162*	7,416	6,561	583	272
(3) Political scientists	*0163*	6,797	6,264	368	165
(4) Historians	*0164*	12,548	12,080	229	239
(5) Other social scientists	*0165*	8,059	5,214	1,244	1,601
g. Total (*sum of a to f*)	*0100*	204,041	140,337	39,362	24,342
h. FTE distribution, by function [b]	*0190*	204,041	132,317	46,977	24,747

Item 2. **Full-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	PH.D. OR SC.D. (2)	M.D., D.D.S., ETC. (3)	MASTER'S (4)	BACHELOR'S OR THE EQUIVALENT (5)
a. Engineers	*0210*	21,431	10,429	75	7,267	3,660
b. Physical scientists	*0220*	30,029	20,201	166	7,636	2,026
c. Mathematicians	*0230*	18,407	7,831	83	9,307	1,186
d. Life scientists	*0240*	79,148	28,043	28,398	12,633	10,074
e. Psychologists	*0250*	11,576	7,624	148	3,391	413
f. Social scientists	*0260*	43,450	22,645	337	18,184	2,284
g. Total (*sum of a to f*)	*0200*	204,041	96,773	29,207	58,418	19,643

[a] Totals in items 1a to 1g, column 1, *should be the same* as the corresponding totals in items 2a to 2g, column 1.

[b] The total reported in item 1h, column 1, should, by definition, be the same as the total in item 1g, column 1. However, the FTE distribution by function (columns 2, 3, and 4) will not necessarily coincide with the functional distribution on a "primarily employed" basis in item 1g.

Item 3. **Part-time scientists and engineers, by field and function in which *primarily* employed; and total full-time equivalents, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	*0310*	4,396	3,582	733	81
(1) Aeronautical engineers	*0311*	174	133	41	-
(2) Chemical engineers	*0312*	275	211	62	2
(3) Civil engineers	*0313*	731	569	147	15
(4) Electrical engineers	*0314*	1,303	1,087	199	17
(5) Mechanical engineers	*0315*	838	706	102	30
(6) Other engineers	*0316*	1,075	876	182	17
b. Physical scientists (total)	*0320*	4,250	3,314	858	78
(1) Chemists	*0321*	1,724	1,408	285	31
(2) Earth scientists	*0322*	674	488	164	22
(3) Physicists	*0323*	1,448	1,131	299	18
(4) Other physical scientists	*0324*	404	287	110	7
c. Mathematicians (total)	*0330*	4,405	4,013	278	114
d. Life scientists (total)	*0340*	23,660	14,810	6,271	2,579
(1) Agricultural scientists	*0341*	1,375	410	592	373
(2) Biological scientists	*0342*	3,827	2,645	1,103	79
(3) Medical scientists	*0343*	18,458	11,755	4,576	2,127
e. Psychologists (total)	*0350*	3,365	2,813	341	211
f. Social scientists (total)	*0360*	9,419	7,589	777	1,053
(1) Economists	*0361*	1,868	1,589	237	42
(2) Sociologists	*0362*	2,056	1,879	102	75
(3) Political scientists	*0363*	1,169	1,103	34	32
(4) Historians	*0364*	1,912	1,793	38	81
(5) Other social scientists	*0365*	2,414	1,225	366	823
g. Total (*sum of a to f*)	*0300*	49,495	36,121	9,258	4,116
h. FTE distribution, by function [b]	*0390*	18,907	13,600	4,065	1,242

Item 4. **Part-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (2)	PH.D. OR SC.D. (2)	M.D., D.D.S., ETC. (3)	MASTER'S (4)	BACHELOR'S OR THE EQUIVALENT (5)
a. Engineers	*0410*	4,396	1,160	31	1,819	1,386
b. Physical scientists	*0420*	4,250	1,566	28	1,599	1,057
c. Mathematicians	*0430*	4,405	697	25	2,734	949
d. Life scientists	*0440*	23,660	3,602	16,074	2,340	1,644
e. Psychologists	*0450*	3,365	1,548	128	1,393	296
f. Social scientists	*0460*	9,419	2,520	126	5,552	1,221
g. Total (*sum of a to f*)	*0400*	49,495	11,093	16,412	15,437	6,553

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[a] Totals in items 3a to 3g, column 1, *should be the same* as the corresponding totals in items 4a to 4g, column 1.

[b] The totals in item 3h converting figures on part-time employment into FTE's will necessarily differ from head-count totals in item 3g.

SECTION B
NUMBER OF GRADUATE STUDENTS ENGAGED PART TIME AS SCIENTISTS AND ENGINEERS

Item 5. **Graduate students receiving compensation for part-time services as scientists and engineers at your institution, by field and function in which *primarily* engaged; and total FTE's, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	*0510*	13,420	5,286	7,718	416
(1) Aeronautical engineers	*0511*	853	285	537	31
(2) Chemical engineers	*0512*	1,664	713	872	79
(3) Civil engineers	*0513*	2,018	807	1,168	43
(4) Electrical engineers	*0514*	3,418	1,457	1,868	93
(5) Mechanical engineers	*0515*	2,153	985	1,086	82
(6) Other engineers	*0516*	3,314	1,039	2,187	88
b. Physical scientists (total)	*0520*	23,163	12,001	10,600	562
(1) Chemists	*0521*	10,867	6,362	4,266	239
(2) Earth scientists	*0522*	3,378	1,803	1,451	124
(3) Physicists	*0523*	7,776	3,585	4,036	155
(4) Other physical scientists	*0524*	1,142	251	847	44
c. Mathematicians (total)	*0530*	7,696	5,824	1,576	296
d. Life scientists (total)	*0540*	20,023	9,072	9,890	1,061
(1) Agricultural scientists	*0541*	4,530	849	3,552	129
(2) Biological scientists	*0542*	10,997	6,122	4,524	351
(3) Medical scientists	*0543*	4,496	2,101	1,814	581
e. Psychologists (total)	*0550*	5,421	3,137	1,929	355
f. Social scientists (total)	*0560*	14,668	9,517	3,963	1,188
(1) Economists	*0561*	3,347	1,932	1,236	179
(2) Sociologists	*0562*	2,477	1,563	715	199
(3) Political scientists	*0563*	2,327	1,581	500	246
(4) Historians	*0564*	3,258	2,646	362	250
(5) Other social scientists	*0565*	3,259	1,795	1,150	314
g. Total (*sum of a to f*)	*0500*	84,391	44,837	35,676	3,878
h. FTE distribution, by function [a]	*0590*	40,443	20,785	17,612	2,046

[a] The totals in item 5h converting figures on part-time services into FTE's will necessarily differ from head-count totals in item 5g.

SECTION C
NUMBER OF TECHNICIANS EMPLOYED IN THE SCIENCES AND ENGINEERING

Item 6. **Technicians, by field and function in which *primarily* employed, January 1969**

FIELD OF EMPLOYMENT		TOTAL (1)	R & D (2)	OTHER ACTIVITIES (3)
a. Engineering and physical science technicians	*0610*	12,296	8,276	4,020
b. Life science technicians	*0620*	33,476	23,637	9,839
c. Social science technicians	*0630*	2,725	1,912	813
d. Total (*sum of a to c*)	*0600*	48,497	33,825	14,672

PART II—FINANCIAL DATA

(Includes items 7 to 13 of the survey questionnaire)

FINANCIAL DATA REPORTED IN PART II ARE FOR THE FISCAL YEAR, WHICH BEGAN ON JULY 1, 1967 AND ENDED ON JUNE 30, 1968, OR YOUR INSTITUTION'S EQUIVALENT FISCAL YEAR. SPECIFY THE ENDING DATE IF DIFFERENT FROM ABOVE:

ALL FINANCIAL DATA REQUESTED ON THIS FORM SHOULD BE REPORTED IN THOUSANDS OF DOLLARS; FOR EXAMPLE, AN EXPENDITURE OF $25,342 SHOULD BE ROUNDED TO THE NEAREST THOUSAND DOLLARS AND REPORTED IN THE APPROPRIATE COLUMNS AS $25.

SECTION D
CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D)

If your institution did not have any current expenditures for separately budgeted research and development in 1967–68 check "none" in the space provided here and skip to Section E. ☐ None.

(Exclude expenditures for capital equipment and facilities.)

Item 7. **Current expenditures for separately budgeted research and development, by source of funds, 1967-68**

SOURCE OF FUNDS		THOUSANDS OF DOLLARS	
a. Federal Government	*0710*	$ 1,572,064	equals 8d and 9d (Col. 2)
b. State government	*0720*	215,088	
c. Local government	*0730*	10,387	
d. Foundations	*0740*	71,625	
e. Voluntary health agencies	*0750*	23,639	
f. Industry	*0760*	55,253	
g. Institution's own funds	*0770*	164,530	
h. Other sources	*0780*	36,122	
i. Total *(sum of a to h)**	*0700*	$ 2,148,708	equals 8d and 9d (Col. 1)

Item 8. **Total and federally financed current expenditures for separately budgeted research and development, by major cost item, 1967–68.**

COST ITEM		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Direct wages and salaries	*0810*	$ 1,152,238	$ 802,694
b. All other direct costs (including materials and supplies)	*0820*	716,483	534,739
c. Indirect costs reimbursed or reimbursable	*0830*	279,987	234,631
d. Total *(sum of a to c)**	*0800*	$ 2,148,708	$ 1,572,064

Item 9. **Total and federally financed current expenditures for separately budgeted research and development, by type of R&D activity, 1967-68**

TYPE OF R&D ACTIVITY		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Basic research	*0910*	$ 1,652,830	$ 1,250,782
b. Applied research	*0920*	404,429	253,577
c. Development	*0930*	91,449	67,705
d. Total *(sum of a to c)**	*0900*	$ 2,148,708	$ 1,572,064

* Totals in items 7i, 8d (Col. 1) and 9d (Col. 1) should be identical. Similarly, figures reported in items 7a, 8d (Col. 2) and 9d (Col. 2) should be identical. If figures for the foregoing items are not consistent, please give reasons in "Remarks" at the end of the questionnaire.

Item 10. **Total and federally financed current expenditures for separately budgeted basic and applied research, by field of science, 1967-68**

FIELD OF SCIENCE		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Engineering (total)	*1010*	$ 275,817	$ 217,358
b. Physical sciences (total)	*1020*	$ 312,249	$ 267,862
(1) Astronomy	*1021*	23,539	20,680
(2) Chemistry	*1022*	102,243	81,098
(3) Physics	*1023*	168,615	153,272
(4) Physical sciences, NEC	*1024*	17,852	12,812
c. Environmental sciences (total)	*1030*	$ 116,277	$ 85,889
d. Mathematics (total)	*1040*	$ 49,924	$ 39,941
e. Life sciences (total)	*1050*	$ 999,892	$ 703,125
(1) Biological	*1051*	463,013	294,124
(2) Clinical medical	*1052*	467,801	372,391
(3) Life sciences, NEC	*1053*	69,078	36,610
f. Psychology (total)	*1060*	$ 58,197	$ 47,458
(1) Biological aspects	*1061*	16,296	13,325
(2) Social aspects	*1062*	29,984	24,163
(3) Psychological sciences, NEC	*1063*	11,917	9,970
g. Social sciences (total)	*1070*	$ 163,458	$ 98,612
(1) Economics	*1071*	34,098	17,149
(2) Political science	*1072*	20,196	10,212
(3) Sociology	*1073*	37,526	25,517
(4) Social sciences, NEC	*1074*	71,638	45,734
h. Other sciences, NEC (total)	*1080*	$ 81,445	$ 44,114
i. Total (*sum of a to h*)[a]	*1000*	$ 2,057,259	$ 1,504,359

[a] If your institution has development funds please do *not* distribute them by field of science. Totals in 10i (columns 1 and 2) should be identical with the sum of lines 9a and 9b (columns 1 and 2).

SECTION E
CURRENT EXPENDITURES FOR INSTRUCTION AND DEPARTMENTAL RESEARCH IN THE SCIENCES AND ENGINEERING

Item 11. **Current expenditures for instruction and departmental research in the sciences and engineering, by field of science, 1967-68**

FIELD OF SCIENCE		TOTAL INSTRUCTION AND DEPARTMENTAL RESEARCH (THOUSANDS OF DOLLARS)
a. Engineering	*1110*	$ 334,197
b. Physical and environmental sciences	*1120*	432,679
c. Mathematics	*1130*	228,712
d. Life sciences	*1140*	876,708
e. Psychology	*1150*	144,142
f. Social sciences	*1160*	584,301
g. Other sciences, NEC	*1170*	87,403
h. Total (*sum of a to g*)	*1100*	$ 2,688,142

Item 12. **Estimate the dollar amount of overhead or indirect costs allocable to the instruction and departmental research activities reported above (item 11).**

		THOUSANDS OF DOLLARS
	1200	$ 993,702

SECTION F
CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION

Item 13. **Total and federally financed capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction, by field of science, 1967-68**

Prorate any expenditures intended for use in two or more fields of science and for R&D and graduate and undergraduate instruction. Do not include any materials and supplies reported under current expenditures in Section D or Section E. Include current fund expenditures for equipment and facilities as well as plant and other funds.

FIELD OF SCIENCE		THOUSANDS OF DOLLARS					
		TOTAL CAPITAL EXPENDITURES		R&D AND GRADUATE INSTRUCTION		UNDERGRADUATE INSTRUCTION	
		TOTAL (1)	FEDERAL GOVERNMENT (2)	TOTAL (3)	FEDERAL GOVERNMENT (4)	TOTAL (5)	FEDERAL GOVERNMENT (6)
a. Engineering	*1310*	$126,304	$ 39,432	$ 48,622	$ 19,105	$ 77,682	$ 20,327
b. Physical and environmental sciences	*1320*	283,811	95,178	121,209	51,038	162,602	44,140
c. Mathematics	*1330*	55,104	13,676	21,473	5,333	33,631	8,343
d. Life sciences	*1340*	452,707	150,591	273,912	104,770	178,795	45,821
e. Psychology	*1350*	34,425	10,342	19,710	7,571	14,715	2,771
f. Social sciences	*1360*	76,217	17,627	26,822	6,225	49,395	11,402
g. Other sciences, NEC	*1370*	42,159	13,601	16,349	7,956	25,810	5,645
h. Total *(sum of a to g)*	*1300*	1,070,727	340,447	528,097	201,998	542,630	138,449

REMARKS: *(If additional space is needed, attach an extra page)*

NAME OF PERSON SUBMITTING THIS FORM

TITLE

NAME OF INSTITUTION

ADDRESS *(number, street, city, state, ZIP code)*

AREA CODE, TELEPHONE NO., EXT.

DATE

APPENDIX C

Statistical Tables

Medical Schools

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List of Medical Schools Included in Survey

ALABAMA: University of Alabama Medical Center.

ARIZONA: University of Arizona College of Medicine.

ARKANSAS: University of Arkansas Medical Center.

CALIFORNIA:
- Loma Linda University School of Medicine.
- Stanford University School of Medicine.
- University of California School of Medicine (Davis).
- University of California College of Medicine (Irvine).
- University of California School of Medicine (San Diego).
- University of California School of Medicine (Los Angeles).
- University of California School of Medicine (San Francisco).
- University of Southern California School of Medicine.

COLORADO: University of Colorado Medical Center.

CONNECTICUT:
- University of Connecticut Health Center.
- Yale University School of Medicine.

DISTRICT OF COLUMBIA:
- Georgetown University School of Medicine.
- George Washington University School of Medicine.
- Howard University College of Medicine.

FLORIDA:
- University of Florida College of Medicine.
- University of Miami School of Medicine.

GEORGIA:
- Emory University School of Medicine.
- Medical College of Georgia.

HAWAII: University of Hawaii, School of Biomedical Sciences.

ILLINOIS:
- Chicago Medical School.
- Loyola University, Stritch School of Medicine.
- Northwestern University Medical School.
- University of Illinois Medical Center.
- University of Chicago Medical School.

INDIANA: Indiana University School of Medicine.

IOWA: University of Iowa College of Medicine.

KANSAS: University of Kansas Medical Center.

KENTUCKY:
- University of Kentucky College of Medicine.
- University of Louisville School of Medicine.

LOUISIANA:
- Louisiana State University Medical Center (New Orleans).
- Louisiana State University School of Medicine (Shreveport).
- Tulane University School of Medicine.

MARYLAND:
- Johns Hopkins University School of Medicine.
- University of Maryland School of Medicine.

MASSACHUSETTS:
- Boston University School of Medicine.
- Harvard University School of Medicine.
- Tufts University School of Medicine.

MICHIGAN:
- Michigan State University College of Human Medicine.
- University of Michigan Medical School.
- Wayne State University School of Medicine.

MINNESOTA: University of Minnesota Medical School.

MISSISSIPPI: University of Mississippi School of Medicine.

MISSOURI:
- St. Louis University School of Medicine.
- University of Missouri Medical Center.
- Washington University School of Medicine.

NEBRASKA:
- Creighton University School of Medicine.
- University of Nebraska Medical Center.

NEW HAMPSHIRE: Dartmouth Medical School.

NEW JERSEY:
- New Jersey College of Medicine and Dentistry.
- Rutgers—the State University Medical School.

NEW MEXICO: University of New Mexico School of Medicine.

NEW YORK:
- CUNY—Mt. Sinai School of Medicine.
- Columbia University, College of Physicians and Surgeons.
- Cornell University Medical College.
- New York Medical College.
- New York University Medical Center.
- SUNY—Downstate Medical Center.
- SUNY—Upstate Medical Center.
- Albany Medical College of Union University.
- SUNY—Buffalo School of Medicine.
- University of Rochester School of Medicine and Dentistry.
- Yeshiva University, Albert Einstein College of Medicine.

NORTH CAROLINA:
- Duke University School of Medicine.
- University of North Carolina School of Medicine.
- Wake Forest College, Bowman Gray School of Medicine.

NORTH DAKOTA: University of North Dakota School of Medicine.

OHIO:
- Case-Western Reserve University School of Medicine.
- Ohio State University College of Medicine.
- University of Cincinnati College of Medicine.

OKLAHOMA: University of Oklahoma Medical Center.

OREGON: University of Oregon Medical School.

PENNSYLVANIA:
- Hahneman Medical College of Philadelphia.
- Jefferson Medical College of Philadelphia.
- Pennsylvania State University, Milton S. Hershey Medical Center.
- Temple University School of Medicine.
- University of Pennsylvania School of Medicine.
- University of Pittsburgh School of Medicine.
- Woman's Medical College of Pennsylvania.

RHODE ISLAND: Brown University, Program in Medical Science.

SOUTH CAROLINA: Medical College of South Carolina.

SOUTH DAKOTA: University of South Dakota School of Medicine.

TENNESSEE:
- Meharry Medical College.
- University of Tennessee College of Medicine.
- Vanderbilt University School of Medicine.

TEXAS:
- Baylor University College of Medicine.
- University of Texas, M. D. Anderson Hospital and Tumor Institute.
- University of Texas Medical School (San Antonio).
- University of Texas, Southwestern Medical School (Dallas).
- University of Texas Medical Branch (Galveston).

UTAH: University of Utah College of Medicine.

VERMONT: University of Vermont College of Medicine.

VIRGINIA:
- Medical College of Virginia.
- University of Virginia School of Medicine.

WASHINGTON: University of Washington School of Medicine.

WEST VIRGINIA: West Virginia University School of Medicine.

WISCONSIN:
- Marquette School of Medicine, Inc.
- University of Wisconsin Medical School.

PUERTO RICO: University of Puerto Rico, Medical Sciences Campus.

TABLE C-1.—*Selected employment characteristics of scientists in medical schools, 1965, 1967, and 1969*

Item	January 1965		January 1967		January 1969	
	Number	Percent distribution	Number	Percent distribution	Number	Percent distribution
Number of scientists	45,793	100.0	47,293	100.0	55,079	100.0
Employment status:						
Full time	29,760	65.0	32,352	68.4	39,237	71.2
Part time	16,033	35.0	14,941	31.6	15,842	28.8
Field of employment:						
Biological scientists	7,287	15.9	8,015	16.9	7,745	14.1
Medical scientists	37,913	82.8	38,496	81.4	46,153	83.8
All other scientists	593	1.3	782	1.7	1,181	2.1
Educational attainment:						
Ph. D	([a])	----------	7,647	16.2	10,269	18.6
M.D., D.D.S., etc	([a])	----------	32,455	68.6	38,752	70.4
Master's	([a])	----------	2,834	6.0	2,358	4.3
Bachelor's	([a])	----------	4,357	9.2	3,700	6.7
FTE scientists	35,178	100.00	37,484	100.0	44,742	100.0
Function:						
Teaching	15,263	43.4	15,253	40.7	17,862	39.9
Research and development	13,058	37.1	14,144	37.7	15,772	35.3
Other activities	6,857	19.5	8,087	21.6	11,108	24.8

[a] Separate data not collected.

TABLE C–2.—*Selected employment characteristics of scientists in medical schools, as compared with scientists in all other organizational units of universities and colleges, January 1969*

Item	Medical schools		All other organizational units	
	Number	Percent distribution	Number	Percent distribution
Number of scientists	55,079	100.0	198,457	100.0
Employment status:				
Full time	39,237	71.2	164,804	83.0
Part time	15,842	28.8	33,653	17.0
Field of employment:				
Biological scientists	7,745	14.1	21,754	11.0
Medical scientists	46,153	83.8	11,818	6.0
All other scientists	1,181	2.1	164,885	83.1
Educational attainment:				
Ph. D	10,269	18.6	97,597	49.2
M.D., D.D.S., etc	38,752	70.4	6,867	3.5
Master's	2,358	4.3	71,497	36.0
Bachelor's	3,700	6.7	22,496	11.3
FTE scientists	44,742	100.0	178,206	100.0
Function:				
Teaching	17,862	39.9	128,055	71.9
Research and development	15,772	35.3	35,270	19.8
Other activities	11,108	24.8	14,881	8.4

TABLE C–3.—*Number of scientists employed in medical schools, by geographic division, 1965, 1967, and 1969*

Geographic division	January 1965		January 1967		January 1	
	Number	Percent distribution	Number	Percent distribution	Number	Percent distribution
United States, total	45,793	100.0	47,293	100.0	55,079	100.0
New England	3,388	7.4	3,638	7.7	4,638	8.4
Middle Atlantic	13,870	30.3	14,059	29.7	15,791	28.7
East North Central	7,514	16.4	6,980	14.8	8,816	16.0
West North Central	2,995	6.5	3,592	7.6	4,031	7.3
South Atlantic	6,957	15.2	7,611	16.1	7,868	14.3
East South Central	1,818	4.0	1,945	4.1	2,440	4.4
West South Central	2,488	5.4	2,956	6.3	4,337	7.9
Mountain	1,282	2.8	1,427	3.0	1,827	3.3
Pacific	4,858	10.6	4,448	9.4	4,713	8.6
Outlying areas	623	1.4	637	1.3	618	1.1

TABLE C-4.—*Selected characteristics of graduate students receiving stipends for part-time services as scientists in medical schools, as compared with all other organizational units of universities and colleges, 1969*

Item	Medical schools		All other organizational units	
	Number	Percent distribution	Number	Percent distribution
Number of graduate students receiving stipends for part-time services as scientists	5,781	100.0	78,610	100.0
Field of science:				
Biological sciences	1,860	32.2	9,137	11.6
Medical sciences	3,746	64.8	750	1.0
All other sciences	175	3.0	68,723	87.4
FTE graduate students	2,793	100.0	37,650	100.0
Function:				
Teaching	1,101	39.4	19,684	52.3
Research and development	1,303	46.7	16,309	43.3
Other activities	389	13.9	1,657	4.4

TABLE C-5.—*Number of technicians employed in medical schools, by field and function in which primarily employed, 1965, 1967, and 1969*

Field of employment and function	January 1965		January 1967		January 1969	
	Number	Percent distribution	Number	Percent distribution	Number	Percent distribution
Total	18,173	100.0	19,800	100.0	21,161	100.0
Field of employment:						
Life sciences	17,016	93.6	18,780	94.8	20,458	96.7
All other sciences	1,157	6.4	1,020	5.2	703	3.3
Function:						
Research and development	12,885	70.9	14,736	74.4	14,966	70.7
Other activities	5,288	29.1	5,064	25.6	6,195	29.3

TABLE C–6.—*Selected financial characteristics of scientific activities in medical schools, 1964, 1966, and 1968*

(Dollars in thousands)

Type of expenditure	1964		1966		1968	
	Amount	Percent distribution	Amount	Percent distribution	Amount	Percent distribution
Separately budgeted R&D expenditures	$351,057	100.0	$451,727	100.0	$581,273	100.0
Source of funds:						
Federal Government	284,039	80.9	369,172	81.7	474,210	81.6
Other sources	67,018	19.1	82,555	18.3	107,063	18.4
Character of work:						
Basic research	300,203	85.5	384,722	85.2	488,570	84.1
Applied research	45,687	13.0	60,034	13.3	84,160	14.5
Development	5,167	1.5	6,971	1.5	8,543	1.5
Field of science:[a]	345,890	100.0	444,756	100.0	572,730	100.0
Biological sciences	76,439	22.1	107,272	24.1	146,784	25.6
Clinical medical sciences	269,025	77.8	334,725	75.3	406,600	71.0
All other sciences	426	.1	2,759	.6	19,346	3.4
Current direct expenditures for instruction and departmental research	253,046	100.0	321,785	100.0	414,325	100.0
Life sciences	252,299	99.7	321,546	99.9	408,701	98.6
All other sciences	747	.3	239	.1	5,624	1.4
Capital expenditures for research, development, and instruction	105,587	100.0	127,708	100.0	189,398	100.0
Source of funds:						
Federal Government	48,510	45.9	46,399	36.3	78,989	41.7
Other sources	57,077	54.1	81,309	63.7	110,409	58.3
Purpose:						
R&D and graduate instruction	88,083	83.4	101,172	79.2	154,981	81.8
Undergraduate instruction	17,504	16.6	26,536	20.8	34,417	18.2
Field of science:						
Life sciences	105,560	100.0	127,547	99.9	188,607	99.6
All other sciences	27	([b])	161	.1	791	.4

[a] Excludes development, for which field-of-science distribution was not requested.

[b] Less than 0.05 percent.

TABLE C-7.—*Selected financial characteristics of scientific activities in medical schools, as compared with all other organizational units of universities and colleges, 1968*

(Dollars in thousands)

Type of expenditure	Medical schools		All other organizational units	
	Amount	Percent distribution	Amount	Percent distribution
Separately budgeted R&D expenditures	$581,273	100.0	$1,567,435	100.0
Source of funds:				
Federal Government	474,210	81.6	1,097,854	70.0
Other sources	107,063	18.4	469,581	30.0
Character of work:				
Basic research	488,570	84.1	1,164,260	74.3
Applied research	84,160	14.5	320,269	20.4
Development	8,543	1.5	82,906	5.3
Field of science:[a]	572,730	100.0	1,484,529	100.0
Biological sciences	146,784	25.7	316,229	21.3
Clinical medical sciences	406,600	71.0	61,201	4.1
All other sciences	19,346	3.4	1,107,099	74.6
Current direct expenditures for instruction and departmental research	414,325	100.0	2,273,817	100.0
Life sciences	408,701	98.6	468,007	20.6
All other sciences	5,624	1.4	1,805,810	79.4
Capital expenditures for research, development, and instruction	189,398	100.0	881,329	100.0
Source of funds:				
Federal Government	78,989	41.7	261,458	29.7
Other sources	110,409	58.3	619,871	70.3
Purpose:				
R&D and graduate instruction	154,981	81.8	373,116	42.3
Undergraduate instruction	34,417	18.2	508,213	57.7
Field of science:				
Life sciences	188,607	99.6	264,100	30.0
All other sciences	791	.4	617,229	70.0

[a] Excludes development, for which field-of-science distribution was not requested.

TABLE C–8.—*Current and capital expenditures for research, development, and instruction in the sciences and engineering in medical schools, by geographic division and source of funds, 1968*

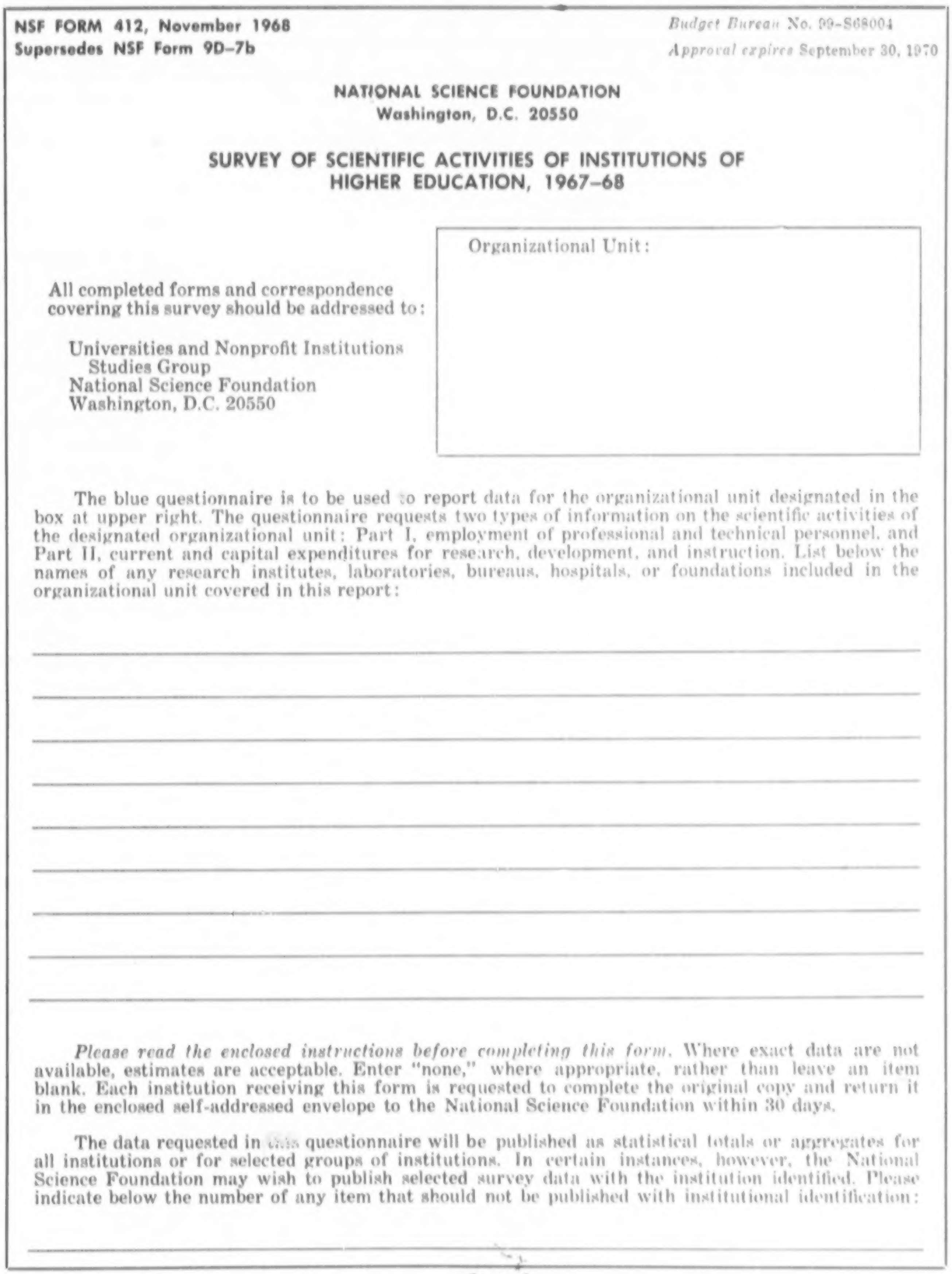
(Dollars in thousands)

Geographic division	Separately budgeted R&D			Current direct expenditures for instruction and departmental research	Capital expenditures		
	Total	Federal Government	Other sources		Total	Federal Government	Other sources
United States, total	$581,273	$474,210	$107,063	$414,325	$189,398	$78,989	$110,409
New England	45,002	40,338	4,664	23,341	9,766	5,544	4,222
Middle Atlantic	159,199	125,133	34,066	85,091	61,157	20,795	40,362
East North Central	87,503	65,478	22,025	68,528	22,058	9,093	12,965
West North Central	49,978	44,046	5,932	36,380	12,613	6,766	5,847
South Atlantic	75,943	60,752	15,191	62,405	23,780	13,808	9,972
East South Central	26,403	23,318	3,085	32,168	12,976	4,160	8,816
West South Central	43,875	36,237	7,638	26,542	10,336	5,860	4,476
Mountain	14,240	11,261	2,979	17,807	10,491	3,482	7,009
Pacific	76,411	65,105	11,306	56,867	24,638	8,927	15,711
Outlying areas	2,719	2,542	177	5,196	1,583	554	1,029

APPENDIX C

Reproduction of Survey Form

(Aggregate data from 101 medical schools)



NSF FORM 412, November 1968
Supersedes NSF Form 9D–7b

Budget Bureau No. 99-S68004
Approval expires September 30, 1970

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC ACTIVITIES OF INSTITUTIONS OF HIGHER EDUCATION, 1967–68

Organizational Unit:

All completed forms and correspondence covering this survey should be addressed to:

Universities and Nonprofit Institutions
Studies Group
National Science Foundation
Washington, D.C. 20550

The blue questionnaire is to be used to report data for the organizational unit designated in the box at upper right. The questionnaire requests two types of information on the scientific activities of the designated organizational unit: Part I, employment of professional and technical personnel, and Part II, current and capital expenditures for research, development, and instruction. List below the names of any research institutes, laboratories, bureaus, hospitals, or foundations included in the organizational unit covered in this report:

Please read the enclosed instructions before completing this form. Where exact data are not available, estimates are acceptable. Enter "none," where appropriate, rather than leave an item blank. Each institution receiving this form is requested to complete the original copy and return it in the enclosed self-addressed envelope to the National Science Foundation within 30 days.

The data requested in this questionnaire will be published as statistical totals or aggregates for all institutions or for selected groups of institutions. In certain instances, however, the National Science Foundation may wish to publish selected survey data with the institution identified. Please indicate below the number of any item that should not be published with institutional identification:

PART I—PERSONNEL DATA

(Includes items 1 to 6 of the survey questionnaire)

Personnel data are to be reported as of January 1969 or as close as possible thereto.

SECTION A
NUMBER OF SCIENTISTS AND ENGINEERS

(NOTE: Figures on graduate students engaged part time as scientists and engineers should be reported in Section B.)

Item 1. **Full-time scientists and engineers, by field and function in which *primarily* employed; and total full-time equivalents, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	0110	59	7	41	11
(1) Aeronautical engineers	0111	2	-	2	-
(2) Chemical engineers	0112	2	-	2	-
(3) Civil engineers	0113	1	-	-	1
(4) Electrical engineers	0114	24	1	18	5
(5) Mechanical engineers	0115	7	-	4	3
(6) Other engineers	0116	23	6	15	2
b. Physical scientists (total)	0120	321	82	230	9
(1) Chemists	0121	245	67	170	8
(2) Earth scientists	0122	-	-	-	-
(3) Physicists	0123	42	15	27	-
(4) Other physical scientists	0124	34	-	33	1
c. Mathematicians (total)	0130	81	17	53	11
d. Life scientists (total)	0140	38,209	14,986	12,417	10,806
(1) Agricultural scientists	0141	1	-	-	1
(2) Biological scientists	0142	6,561	3,086	3,014	461
(3) Medical scientists	0143	31,647	11,900	9,403	10,344
e. Psychologists (total)	0150	361	166	82	113
f. Social scientists (total)	0160	206	50	38	118
(1) Economists	0161	3	1	1	1
(2) Sociologists	0162	81	19	10	52
(3) Political scientists	0163	-	-	-	-
(4) Historians	0164	3	2	1	-
(5) Other social scientists	0165	119	28	26	65
g. Total (*sum of a to f*)	0100	39,237	15,308	12,861	11,068
h. FTE distribution, by function [b]	0190	39,237	14,781	14,074	10,382

Item 2. **Full-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	PH.D. OR SC.D. (2)	M.D., D.D.S., ETC. (3)	MASTER'S (4)	BACHELOR'S OR THE EQUIVALENT (5)
a. Engineers	0210	59	10	2	10	37
b. Physical scientists	0220	321	150	6	49	116
c. Mathematicians	0230	81	25	3	20	33
d. Life scientists	0240	38,209	8,010	25,587	1,797	2,815
e. Psychologists	0250	361	231	66	41	23
f. Social scientists	0260	206	42	40	73	51
g. Total (*sum of a to f*)	0200	39,237	8,468	25,704	1,990	3,075

[a] Totals in items 1a to 1g, column 1, *should be the same* as the corresponding totals in items 2a to 2g, column 1.

[b] The total reported in item 1h, column 1, should, by definition, be the same as the total in item 1g, column 1. However, the FTE distribution by function (columns 2, 3, and 4) will not necessarily coincide with the functional distribution on a "primarily employed" basis in item 1g.

Item 3. **Part-time scientists and engineers, by field and function in which *primarily* employed; and total full-time equivalents, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	0310	2	-	2	-
(1) Aeronautical engineers	0311	1	-	1	-
(2) Chemical engineers	0312	-	-	-	-
(3) Civil engineers	0313	-	-	-	-
(4) Electrical engineers	0314	-	-	-	-
(5) Mechanical engineers	0315	1	-	1	-
(6) Other engineers	0316	-	-	-	-
b. Physical scientists (total)	0320	11	4	5	2
(1) Chemists	0321	6	1	3	2
(2) Earth scientists	0322	-	-	-	-
(3) Physicists	0323	5	3	2	-
(4) Other physical scientists	0324	-	-	-	-
c. Mathematicians (total)	0330	5	1	2	2
d. Life scientists (total)	0340	15,690	9,319	4,510	1,861
(1) Agricultural scientists	0341	-	-	-	-
(2) Biological scientists	0342	1,184	628	524	32
(3) Medical scientists	0343	14,506	8,691	3,986	1,829
e. Psychologists (total)	0350	107	42	20	45
f. Social scientists (total)	0360	27	7	15	5
(1) Economists	0361	2	2	-	-
(2) Sociologists	0362	12	4	5	3
(3) Political scientists	0363	-	-	-	-
(4) Historians	0364	-	-	-	-
(5) Other social scientists	0365	13	1	10	2
g. Total (*sum of a to f*)	0300	15,842	9,373	4,554	1,915
h. FTE distribution, by function [b]	0390	5,505	3,081	1,698	726

Item 4. **Part-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	PH.D. OR SC.D. (2)	M.D., D.D.S., ETC. (3)	MASTER'S (4)	BACHELOR'S OR THE EQUIVALENT (5)
a. Engineers	0410	2	1	-	1	-
b. Physical scientists	0420	11	4	-	5	2
c. Mathematicians	0430	5	1	1	2	1
d. Life scientists	0440	15,690	1,744	13,004	327	615
e. Psychologists	0450	107	46	42	19	-
f. Social scientists	0460	27	5	1	14	7
g. Total (*sum of a to f*)	0400	15,842	1,801	13,048	368	625

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[a] Totals in items 3a to 3g, column 1, *should be the same* as the corresponding totals in items 4a to 4g, column 1.

[b] The totals in item 3h converting figures on part-time employment into FTE's will necessarily differ from head-count totals in item 3g.

SECTION B
NUMBER OF GRADUATE STUDENTS ENGAGED PART TIME AS SCIENTISTS AND ENGINEERS

Item 5. **Graduate students receiving compensation for part-time services as scientists and engineers at your institution, by field and function in which *primarily* engaged; and total FTE's, by function, January 1969.**

FIELD OF EMPLOYMENT		TOTAL (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	0510	9	3	6	-
(1) Aeronautical engineers	0511	4	-	4	-
(2) Chemical engineers	0512	5	3	2	-
(3) Civil engineers	0513	-	-	-	-
(4) Electrical engineers	0514	-	-	-	-
(5) Mechanical engineers	0515	-	-	-	-
(6) Other engineers	0516	-	-	-	-
b. Physical scientists (total)	0520	78	32	46	-
(1) Chemists	0521	70	31	39	-
(2) Earth scientists	0522	-	-	-	-
(3) Physicists	0523	8	1	7	-
(4) Other physical scientists	0524	-	-	-	-
c. Mathematicians (total)	0530	3	2	1	-
d. Life scientists (total)	0540	5,606	2,255	2,705	646
(1) Agricultural scientists	0541	-	-	-	-
(2) Biological scientists	0542	1,860	621	1,157	82
(3) Medical scientists	0543	3,746	1,634	1,548	564
e. Psychologists (total)	0550	81	36	44	1
f. Social scientists (total)	0560	4	-	-	4
(1) Economists	0561	-	-	-	-
(2) Sociologists	0562	2	-	-	2
(3) Political scientists	0563	-	-	-	-
(4) Historians	0564	-	-	-	-
(5) Other social scientists	0565	2	-	-	2
g. Total (*sum of a to f*)	0500	5,781	2,328	2,802	651
h. FTE distribution, by function [a]	0590	2,793	1,101	1,303	389

[a] The totals in item 5h converting figures on part-time services into FTE's will necessarily differ from head-count totals in item 5g.

SECTION C
NUMBER OF TECHNICIANS EMPLOYED IN THE SCIENCES AND ENGINEERING

Item 6. **Technicians, by field and function in which *primarily* employed, January 1969**

FIELD OF EMPLOYMENT		TOTAL (1)	R & D (2)	OTHER ACTIVITIES (3)
a. Engineering and physical science technicians	0610	181	125	56
b. Life science technicians	0620	20,458	14,411	6,047
c. Social science technicians	0630	522	430	92
d. Total (*sum of a to c*)	0600	21,161	14,966	6,195

PART II—FINANCIAL DATA

(Includes items 7 to 13 of the survey questionnaire)

FINANCIAL DATA REPORTED IN PART II ARE FOR THE FISCAL YEAR, WHICH BEGAN ON JULY 1, 1967 AND ENDED ON JUNE 30, 1968, OR YOUR INSTITUTION'S EQUIVALENT FISCAL YEAR. SPECIFY THE ENDING DATE IF DIFFERENT FROM ABOVE:

____

ALL FINANCIAL DATA REQUESTED ON THIS FORM SHOULD BE REPORTED IN THOUSANDS OF DOLLARS; FOR EXAMPLE, AN EXPENDITURE OF $25,342 SHOULD BE ROUNDED TO THE NEAREST THOUSAND DOLLARS AND REPORTED IN THE APPROPRIATE COLUMNS AS $25.

SECTION D
CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D)

If your institution did not have any current expenditures for separately budgeted research and development in 1967–68 check "none" in the space provided here and skip to Section E. ☐ None.

(Exclude expenditures for capital equipment and facilities.)

Item 7. **Current expenditures for separately budgeted research and development, by source of funds, 1967-68**

SOURCE OF FUNDS		THOUSANDS OF DOLLARS	
a. Federal Government	*0710*	$ 474,210	equals 8d and 9d (Col. 2)
b. State government	*0720*	12,474	
c. Local government	*0730*	5,604	
d. Foundations	*0740*	23,505	
e. Voluntary health agencies	*0750*	19,068	
f. Industry	*0760*	9,797	
g. Institution's own funds	*0770*	22,825	
h. Other sources	*0780*	13,790	
i. Total *(sum of a to h)*[a]	*0700*	$ 581,273	equals 8d and 9d (Col. 1)

Item 8. **Total and federally financed current expenditures for separately budgeted research and development, by major cost item, 1967–68.**

COST ITEM		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Direct wages and salaries	*0810*	$ 302,388	$ 243,537
b. All other direct costs (including materials and supplies)	*0820*	199,835	162,542
c. Indirect costs reimbursed or reimbursable	*0830*	79,050	68,131
d. Total *(sum of a to c)*[a]	*0800*	$ 581,273	$ 474,210

Item 9. **Total and federally financed current expenditures for separately budgeted research and development, by type of R&D activity, 1967-68**

TYPE OF R&D ACTIVITY		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Basic research	*0910*	$ 488,570	$ 402,176
b. Applied research	*0920*	84,160	64,984
c. Development	*0930*	8,543	7,050
d. Total *(sum of a to c)*[a]	*0900*	$ 581,273	$ 474,210

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[a] Totals in items 7i, 8d (Col. 1) and 9d (Col. 1) should be identical. Similarly, figures reported in items 7a, 8d (Col. 2) and 9d (Col. 2) should be identical. If figures for the foregoing items are not consistent, please give reasons in "Remarks" at the end of the questionnaire.

Item 10. **Total and federally financed current expenditures for separately budgeted basic and applied research, by field of science, 1967-68**

FIELD OF SCIENCE		THOUSANDS OF DOLLARS TOTAL (1)	THOUSANDS OF DOLLARS FEDERAL GOVERNMENT (2)
a. Engineering (total)	*1010*	$ 227	$ 227
b. Physical sciences (total)	*1020*	$ 1,932	$ 1,060
(1) Astronomy	*1021*	-	-
(2) Chemistry	*1022*	1,613	956
(3) Physics	*1023*	319	104
(4) Physical sciences, NEC	*1024*	-	-
c. Environmental sciences (total)	*1030*	$ -	$ -
d. Mathematics (total)	*1040*	$ 417	$ 368
e. Life sciences (total)	*1050*	$ 568,236	$ 463,904
(1) Biological	*1051*	146,784	126,919
(2) Clinical medical	*1052*	406,600	324,897
(3) Life sciences, NEC	*1053*	14,852	12,088
f. Psychology (total)	*1060*	$ 861	$ 708
(1) Biological aspects	*1061*	615	540
(2) Social aspects	*1062*	154	76
(3) Psychological sciences, NEC	*1063*	92	92
g. Social sciences (total)	*1070*	$ 296	$ 288
(1) Economics	*1071*	-	-
(2) Political science	*1072*	-	-
(3) Sociology	*1073*	21	21
(4) Social sciences, NEC	*1074*	275	267
h. Other sciences, NEC (total)	*1080*	$ 761	$ 605
i. Total (*sum of a to h*)[a]	*1000*	$ 572,730	$ 467,160

[a] If your institution has development funds please do *not* distribute them by field of science. Totals in 10i (columns 1 and 2) should be identical with the sum of lines 9a and 9b (columns 1 and 2).

SECTION E
CURRENT EXPENDITURES FOR INSTRUCTION AND DEPARTMENTAL RESEARCH IN THE SCIENCES AND ENGINEERING

Item 11. **Current expenditures for instruction and departmental research in the sciences and engineering, by field of science, 1967-68**

FIELD OF SCIENCE		TOTAL INSTRUCTION AND DEPARTMENTAL RESEARCH (THOUSANDS OF DOLLARS)
a. Engineering	*1110*	$ 77
b. Physical and environmental sciences	*1120*	507
c. Mathematics	*1130*	3,377
d. Life sciences	*1140*	408,701
e. Psychology	*1150*	906
f. Social sciences	*1160*	387
g. Other sciences,NEC	*1170*	370
h. Total (*sum of a to g*)	*1100*	$ 414,325

Item 12. **Estimate the dollar amount of overhead or indirect costs allocable to the instruction and departmental research activities reported above (item 11).**

		THOUSANDS OF DOLLARS
	1200	$ 133,924

SECTION F
CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION

Item 13. **Total and federally financed capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction, by field of science, 1967-68**

Prorate any expenditures intended for use in two or more fields of science and for R&D and graduate and undergraduate instruction. Do not include any materials and supplies reported under current expenditures in Section D or Section E. Include current fund expenditures for equipment and facilities as well as plant and other funds.

FIELD OF SCIENCE		THOUSANDS OF DOLLARS					
		TOTAL CAPITAL EXPENDITURES		R&D AND GRADUATE INSTRUCTION		UNDERGRADUATE INSTRUCTION	
		TOTAL (1)	FEDERAL GOVERNMENT (2)	TOTAL (3)	FEDERAL GOVERNMENT (4)	TOTAL (5)	FEDERAL GOVERNMENT (6)
a. Engineering	*1310*	$ -	$ -	$ -	$ -	$ -	$ -
b. Physical and environmental sciences	*1320*	71	-	11	-	60	-
c. Mathematics	*1330*	-	-	-	-	-	-
d. Life sciences	*1340*	188,607	78,919	154,262	67,048	34,345	11,871
e. Psychology	*1350*	660	50	660	50	-	-
f. Social sciences	*1360*	30	-	18	-	12	-
g. Other sciences, NEC	*1370*	30	20	30	20	-	-
h. Total *(sum of a to g)*	*1300*	$ 189,398	$78,989	$154,981	$ 67,118	$ 34,417	$11,871

REMARKS: *(If additional space is needed, attach an extra page)*

NAME OF PERSON SUBMITTING THIS FORM	TITLE
NAME OF INSTITUTION	ADDRESS *(number, street, city, state, ZIP code)*
AREA CODE, TELEPHONE NO., EXT. / DATE	

APPENDIX D

Statistical Tables

University-Administered Federally Funded Research and Development Centers (Part II)

Page

D-1. Selected employment characteristics of scientific activities in university-administered FFRDC's, January 1969 ---------- 128

D-2. Current R&D expenditures in university-administered FFRDC's, by character of work, 1953-68 ---------- 128

D-3. Selected financial characteristics of scientific activities in university-administered FFRDC's, 1968 ---------- 129

APPENDIX D

List of Federally Funded Research and Development Centers Administered by Universities and University Consortia[1]

Department of Defense

- Department of the Army
  - Army Mathematics Center (University of Wisconsin).
  - Center for Research in Social Systems (American University).
  - Human Resources Research Office (George Washington University).
- Department of the Navy
  - Applied Physics Laboratory (Johns Hopkins University).
  - Applied Physics Laboratory (University of Washington).
  - Center for Naval Analyses (University of Rochester).
  - Hudson Laboratories (Columbia University).
  - Ordnance Research Laboratory (Pennsylvania State University).
- Department of the Air Force
  - Lincoln Laboratory (Massachusetts Institute of Technology).

Department of Health, Education, and Welfare

- Office of Education
  - Center for the Advanced Study of Educational Administration (University of Oregon).
  - Center for Research and Development in Higher Education (University of California).
  - Center for Research and Development for Learning and Reeducation (University of Wisconsin).
  - Center for the Study of the Evaluation of Instructional Programs (University of California).
  - Center for the Study of Social Organization of Schools and the Learning Process (Johns Hopkins University).
  - Coordination Center for the National Program in Early Childhood Education (University of Illinois).
  - Learning Research and Development Center (University of Pittsburgh).
  - Research and Development Center in Educational Stimulation (University of Georgia).
  - Research and Development Center in Teacher Education (University of Texas).
  - Stanford Center for Research and Development in Teaching (Stanford University).

Atomic Energy Commission

- Ames Laboratory (Iowa State University of Science and Technology).
- Argonne National Laboratory (University of Chicago and Argonne Universities Association).
- Brookhaven National Laboratory (Associated Universities, Inc.).
- Cambridge Electron Accelerator (Harvard University and Massachusetts Institute of Technology).
- Lawrence Radiation Laboratory, Berkeley and Livermore (University of California).

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[1] All of the organizations listed here were designated by the Federal Council for Science and Technology to be FFRDC's in academic year 1967–68.

Atomic Energy Commission—Continued
- Los Alamos Scientific Laboratory (University of California).
- National Accelerator Laboratory (Universities Research Association).
- Oak Ridge Associated Universities.
- Plasma Physics Laboratory (Princeton University).
- Princeton-Pennsylvania Accelerator (Princeton University and University of Pennsylvania).
- Stanford Linear Accelerator Center (Stanford University).

National Aeronautics and Space Administration
- Jet Propulsion Laboratory (California Institute of Technology).
- Space Radiation Effects Laboratory (College of William and Mary).

National Science Foundation
- Cerro Tololo Inter-American Observatory (Association of Universities for Research in Astronomy, Inc.).
- Kitt Peak National Observatory (Association of Universities for Research in Astronomy, Inc.).
- National Center for Atmospheric Research (University Corporation for Atmospheric Research).
- National Radio Astronomy Observatory (Associated Universities, Inc.).

The institutions comprising the membership of the managing consortia are as follows:

Associated Universities, Inc.
- Columbia University
- Cornell University
- Harvard University
- Johns Hopkins University
- Massachusetts Institute of Technology
- University of Pennsylvania
- Princeton University
- University of Rochester
- Yale University

Association of Universities for Research in Astronomy, Inc.
- University of California
- University of Chicago
- Harvard University
- Indiana University
- University of Michigan
- Ohio State University
- Princeton University
- University of Texas
- University of Wisconsin
- Yale University

University Corporation for Atmospheric Research
- University of Alaska
- University of Arizona
- University of California
- Catholic University of America
- University of Chicago
- Colorado State University
- University of Colorado
- Cornell University
- University of Denver
- Florida State University
- University of Hawaii
- Johns Hopkins University
- University of Maryland
- Massachusetts Institute of Technology
- University of Miami
- University of Michigan
- University of Minnesota
- University of Missouri
- New York University
- University of Oklahoma
- Pennsylvania State University
- St. Louis University
- Texas A&M University
- University of Texas
- University of Utah
- University of Washington
- University of Wisconsin

Oak Ridge Associated Universities
- University of Alabama
- University of Arkansas
- Auburn University
- Catholic University of America
- Clemson University
- Duke University
- Emory University
- Fisk University
- University of Florida
- Florida State University
- University of Georgia
- Georgia Institute of Technology
- University of Kentucky
- Louisiana State University
- University of Louisville
- University of Maryland
- Medical College of Virginia
- Meharry Medical College
- University of Miami
- University of Mississippi

Oak Ridge Associated Universities—Continued
- Mississippi State University
- University of North Carolina
- North Carolina State University
- North Texas State University
- University of Oklahoma
- University of Puerto Rico
- Rice University
- University of South Carolina
- Southern Methodist University
- University of Tennessee
- University of Texas
- Texas A&M University
- Texas Christian University
- Texas Women's University
- Tulane University
- Tuskegee Institute
- Vanderbilt University
- University of Virginia
- Virginia Polytechnic Institute
- West Virginia University
- College of William and Mary

University Research Association
- University of Arizona
- Brown University
- California Institute of Technology
- University of California—Berkeley
- University of California—Los Angeles
- University of California—San Diego
- Carnegie Mellon University
- Case Western Reserve University
- University of Chicago
- University of Colorado
- Columbia University
- Cornell University
- Duke University
- Florida State University
- Harvard University
- University of Illinois
- Indiana University
- Iowa State University
- University of Iowa
- Johns Hopkins University
- University of Maryland
- Massachusetts Institute of Technology
- Michigan State University
- University of Michigan
- University of Minnesota
- University of North Carolina—Chapel Hill
- Northwestern University
- University of Notre Dame
- Ohio State University
- University of Pennsylvania
- Princeton University
- Purdue University
- Rice University
- University of Rochester
- Rockefeller University
- Rutgers, the State University
- Stanford University
- State University of New York—Buffalo
- State University of New York—Stony Brook
- Stevens Institute of Technology
- Syracuse University
- University of Texas
- University of Toronto
- Tulane University
- Vanderbilt University
- University of Virginia
- Washington University—St. Louis
- University of Washington
- University of Wisconsin
- Yale University

Argonne Universities Association
- Carnegie Mellon University
- Case Western Reserve University
- Illinois Institute of Technology
- Indiana University
- Iowa State University
- Kansas State University
- Loyola University
- Marquette University
- Michigan State University
- Northwestern University
- Ohio State University
- Purdue University
- St. Louis University
- University of Arizona
- University of Chicago
- University of Cincinnati
- University of Illinois
- University of Iowa
- University of Kansas
- University of Michigan
- University of Minnesota
- University of Missouri
- University of Notre Dame
- University of Wisconsin
- Washington University—St. Louis
- Wayne State University

TABLE D–1.—*Selected employment characteristics of scientific activities in university-administered FFRDC's,[a] January 1969*

Federal agency, type of control, and geographic region	Scientists and engineers						Graduate students [c]		Technicians	
	Total number	Field of employment				Full-time equivalents	Total number	Full-time equivalents	Total number	Ratio to 100 FTE scientists and engineers
		Engineers	Physical scientists	Mathematicians	Other scientists [b]					
Total	11,502	5,050	4,415	1,091	946	11,303	942	512	9,068	80.2
Sponsoring Federal agency:										
Atomic Energy Commission	7,222	2,681	3,546	574	421	7,109	599	337	7,515	105.7
Department of Defense	2,290	1,341	413	320	216	2,281	53	30	892	39.1
National Aeronautics and Space Administration	1,387	933	279	159	16	1,386			395	28.5
National Science Foundation	299	92	175	32		298	24	12	214	71.8
Department of Health, Education, and Welfare	304	3	2	6	293	229	266	133	52	22.7
Type of control:										
Public	4,815	1,870	2,168	413	364	4,660	98	49	2,002	43.0
Private	3,969	2,289	851	503	326	3,930	814	448	4,045	102.9
Consortia	2,718	891	1,396	175	256	2,713	30	15	3,021	111.4
Geographic region:										
Northeast	2,196	1,068	737	170	221	2,176	60	32	1,922	88.3
North Central	1,616	540	840	119	117	1,583	240	122	1,776	112.2
South	1,523	649	297	211	366	1,476	89	45	550	37.3
West	6,167	2,793	2,541	591	242	6,068	553	313	4,820	79.4

[a] Federally Funded Research and Development Centers.

[b] Includes psychologists, social, and life scientists.

[c] Includes only those graduate students receiving stipends for part-time services as scientists or engineers.

TABLE D–2.—*Current R&D expenditures in university-administered FFRDC's, by character of work, 1953–68* [a]

(Dollars in millions)

Year	Total	Basic research		Applied research		Development	
		Amount	Percent of total	Amount	Percent of total	Amount	Percent of total
1953[b]	$121	$33	27.3	$44	36.4	$44	36.4
1954	141	39	27.7	51	36.2	51	36.2
1955[b]	180	49	27.2	65	36.1	66	36.7
1956[b]	194	51	26.3	71	36.6	72	37.1
1957[b]	240	65	27.1	86	35.8	89	37.1
1958	293	78	26.6	102	34.8	113	38.6
1959[b]	338	92	27.2	119	35.2	127	37.6
1960[b]	360	97	26.9	122	33.9	141	39.2
1961[b]	410	115	28.0	135	32.9	160	39.0
1962[b]	470	136	28.9	155	33.0	179	38.1
1963[b]	530	159	30.0	170	32.1	201	37.9
1964	629	191	30.4	202	32.1	236	37.5
1965[b]	629	208	33.1	204	32.4	217	34.5
1966	630	227	36.0	207	32.9	196	31.1
1967[b]	673	250	37.1	219	32.5	204	30.3
1968	719	276	38.4	231	32.1	212	29.5

[a] See appendix D for the list of university-administered Federally Funded Research and Development Centers surveyed in 1969.

[b] Estimates derived from related information; no survey took place this year.

TABLE D–3.—*Selected financial characteristics of scientific activities in university-administered FFRDC's,[a] 1968*

(Dollars in thousands)

Federal agency, type of control, and geographic region	Number of FFRDC's	Research and development expenditures				
		Current expenditures				Capital [c] expenditures
		Total [b]	Basic research	Applied research	Development	
Total	36	$718,930	$275,595	$231,207	$212,128	$136,498
Sponsoring Federal agency:						
Atomic Energy Commission	11	437,508	185,742	144,996	106,770	82,635
Department of Defense	9	135,367	22,167	55,861	57,339	3,039
National Aeronautics and Space Administration	2	107,533	35,436	27,444	44,653	41,734
National Science Foundation	4	28,333	26,862	----------	1,471	8,657
Department of Health, Education, and Welfare	10	10,189	5,388	2,906	1,895	433
Type of control:						
Public	14	280,957	84,043	127,110	69,804	30,169
Private	14	267,269	86,595	82,735	97,939	53,257
Consortia[d]	8	170,704	104,957	21,362	44,385	53,072
Geographic region:						
Northeast	8	143,465	70,760	48,594	24,111	21,249
North Central	6	102,265	46,702	11,550	44,013	26,763
South	10	64,794	8,372	21,892	34,530	5,278
West	12	408,406	149,761	149,171	109,474	83,208

[a] Federally Funded Research and Development Centers.

[b] Includes $3.6 million in non-Federal funds.

[c] Includes $2.2 million in non-Federal funds.

[d] Includes one FFRDC administered jointly by a university and a university consortium.

APPENDIX D

Reproduction of Survey Form
(Aggregate data from 36 university-administered FFRDC's)

NSF FORM 412, November 1968
Supersedes NSF Form 9D–7b

Budget Bureau No. 99–S68004
Approval expires September 30, 1970

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC ACTIVITIES OF INSTITUTIONS OF HIGHER EDUCATION, 1967–68

Organizational Unit:

All completed forms and correspondence covering this survey should be addressed to:

Universities and Nonprofit Institutions
Studies Group
National Science Foundation
Washington, D.C. 20550

The blue questionnaire is to be used to report data for the organizational unit designated in the box at upper right. The questionnaire requests two types of information on the scientific activities of the designated organizational unit: Part I, employment of professional and technical personnel, and Part II, current and capital expenditures for research, development, and instruction. List below the names of any research institutes, laboratories, bureaus, hospitals, or foundations included in the organizational unit covered in this report:

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Please read the enclosed instructions before completing this form. Where exact data are not available, estimates are acceptable. Enter "none," where appropriate, rather than leave an item blank. Each institution receiving this form is requested to complete the original copy and return it in the enclosed self-addressed envelope to the National Science Foundation within 30 days.

The data requested in this questionnaire will be published as statistical totals or aggregates for all institutions or for selected groups of institutions. In certain instances, however, the National Science Foundation may wish to publish selected survey data with the institution identified. Please indicate below the number of any item that should not be published with institutional identification:

____

PART I—PERSONNEL DATA

(Includes items 1 to 6 of the survey questionnaire)

Personnel data are to be reported as of January 1969 or as close as possible thereto.

SECTION A
NUMBER OF SCIENTISTS AND ENGINEERS

(NOTE: Figures on graduate students engaged part time as scientists and engineers should be reported in Section B.)

Item 1. **Full-time scientists and engineers, by field and function in which *primarily* employed; and total full-time equivalents, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	*0110*	5,029		4,942	87
(1) Aeronautical engineers	*0111*	183		183	-
(2) Chemical engineers	*0112*	289		282	7
(3) Civil engineers	*0113*	142		137	5
(4) Electrical engineers	*0114*	2,174		2,133	41
(5) Mechanical engineers	*0115*	1,456		1,442	14
(6) Other engineers	*0116*	785		765	20
b. Physical scientists (total)	*0120*	4,264		4,146	118
(1) Chemists	*0121*	1,231		1,183	48
(2) Earth scientists	*0122*	84		84	-
(3) Physicists	*0123*	2,577		2,539	38
(4) Other physical scientists	*0124*	372		340	32
c. Mathematicians (total)	*0130*	1,065		1,061	4
d. Life scientists (total)	*0140*	405		395	10
(1) Agricultural scientists	*0141*	-		-	-
(2) Biological scientists	*0142*	320		311	9
(3) Medical scientists	*0143*	85		84	1
e. Psychologists (total)	*0150*	157		157	-
f. Social scientists (total)	*0160*	237		236	1
(1) Economists	*0161*	41		41	-
(2) Sociologists	*0162*	21		21	-
(3) Political scientists	*0163*	16		16	-
(4) Historians	*0164*	10		9	1
(5) Other social scientists	*0165*	149		149	-
g. Total (*sum of a to f*)	*0100*	11,157		10,937	220
h. FTE distribution, by function [b]	*0190*	11,157		10,941	216

Item 2. **Full-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	PH.D. OR SC.D. (2)	M.D., D.D.S., ETC. (3)	MASTER'S (4)	BACHELOR'S OR THE EQUIVALENT (5)
a. Engineers	*0210*	5,029	694	15	1,457	2,863
b. Physical scientists	*0220*	4,264	2,401	-	737	1,126
c. Mathematicians	*0230*	1,065	145	-	335	585
d. Life scientists	*0240*	405	155	82	63	105
e. Psychologists	*0250*	157	93	-	40	24
f. Social scientists	*0260*	237	85	-	106	46
g. Total (*sum of a to f*)	*0200*	11,157	3,573	97	2,738	4,749

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[a] Totals in items 1a to 1g, column 1, *should be the same* as the corresponding totals in items 2a to 2g, column 1.

[b] The total reported in item 1h, column 1, should, by definition, be the same as the total in item 1g, column 1. However, the FTE distribution by function (columns 2, 3, and 4) will not necessarily coincide with the functional distribution on a "primarily employed" basis in item 1g.

Item 3. **Part-time scientists and engineers, by field and function in which *primarily* employed; and total full-time equivalents, by function, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	0310	21	-	18	3
(1) Aeronautical engineers	0311	-	-	-	-
(2) Chemical engineers	0312	4	-	3	1
(3) Civil engineers	0313	-	-	-	-
(4) Electrical engineers	0314	11	-	10	1
(5) Mechanical engineers	0315	3	-	3	-
(6) Other engineers	0316	3	-	2	1
b. Physical scientists (total)	0320	151	-	148	3
(1) Chemists	0321	39	-	38	1
(2) Earth scientists	0322	1	-	1	-
(3) Physicists	0323	96	-	95	1
(4) Other physical scientists	0324	15	-	14	1
c. Mathematicians (total)	0330	26	-	24	2
d. Life scientists (total)	0340	19	-	19	-
(1) Agricultural scientists	0341	-	-	-	-
(2) Biological scientists	0342	13	-	13	-
(3) Medical scientists	0343	6	-	6	-
e. Psychologists (total)	0350	16	-	16	
f. Social scientists (total)	0360	112	-	112	-
(1) Economists	0361	4	-	4	-
(2) Sociologists	0362	12	-	12	-
(3) Political scientists	0363	1	-	1	-
(4) Historians	0364	2	-	2	-
(5) Other social scientists	0365	93	-	93	-
g. Total (*sum of a to f*)	0300	345	-	337	8
h. FTE distribution, by function [b]	0390	146	-	143	3

Item 4. **Part-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969**

FIELD OF EMPLOYMENT		TOTAL [a] (2)	PH.D. OR SC.D. (2)	M.D., D.D.S., ETC. (3)	MASTER'S (4)	BACHELOR'S OR THE EQUIVALENT (5)
a. Engineers	0410	21	7	-	5	9
b. Physical scientists	0420	151	114	-	18	19
c. Mathematicians	0430	26	6	-	5	15
d. Life scientists	0440	19	6	6	3	4
e. Psychologists	0450	16	11	-	5	-
f. Social scientists	0460	112	73	-	23	16
g. Total (*sum of a to f*)	0400	345	217	6	59	63

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[a] Totals in items 3a to 3g, column 1, *should be the same* as the corresponding totals in items 4a to 4g, column 1.

[b] The totals in item 3h converting figures on part-time employment into FTE's will necessarily differ from head-count totals in item 3g.

SECTION B
NUMBER OF GRADUATE STUDENTS ENGAGED PART TIME AS SCIENTISTS AND ENGINEERS

Item 5. **Graduate students receiving compensation for part-time services as scientists and engineers at your institution, by field and function in which *primarily* engaged; and total FTE's, by function, January 1969.**

FIELD OF EMPLOYMENT		TOTAL (1)	TEACHING (2)	R & D (3)	OTHER ACTIVITIES (4)
a. Engineers (total)	0510	66	-	66	
(1) Aeronautical engineers	0511	-	-	-	
(2) Chemical engineers	0512	16	-	16	
(3) Civil engineers	0513	-	-	-	
(4) Electrical engineers	0514	8	-	8	
(5) Mechanical engineers	0515	1	-	1	
(6) Other engineers	0516	41	-	41	
b. Physical scientists (total)	0520	539	-	539	
(1) Chemists	0521	202	-	202	
(2) Earth scientists	0522	6	-	6	
(3) Physicists	0523	217	-	217	
(4) Other physical scientists	0524	114	-	114	
c. Mathematicians (total)	0530	26	-	26	
d. Life scientists (total)	0540	43	-	43	
(1) Agricultural scientists	0541	-	-	-	
(2) Biological scientists	0542	43	-	43	
(3) Medical scientists	0543	-	-	-	
e. Psychologists (total)	0550	66	-	66	
f. Social scientists (total)	0560	202	-	202	
(1) Economists	0561	3	-	3	
(2) Sociologists	0562	17	-	17	
(3) Political scientists	0563	5	-	5	
(4) Historians	0564	1	-	1	
(5) Other social scientists	0565	176	-	176	
g. Total *(sum of a to f)*	0500	942	-	942	
h. FTE distribution, by function [a]	0590	512	-	512	

[a] The totals in item 5h converting figures on part-time services into FTE's will necessarily differ from head-count totals in item 5g.

SECTION C
NUMBER OF TECHNICIANS EMPLOYED IN THE SCIENCES AND ENGINEERING

Item 6. **Technicians, by field and function in which *primarily* employed, January 1969**

FIELD OF EMPLOYMENT		TOTAL (1)	R & D (2)	OTHER ACTIVITIES (3)
a. Engineering and physical science technicians	0610	8,501	8,012	489
b. Life science technicians	0620	488	488	-
c. Social science technicians	0630	79	79	-
d. Total *(sum of a to c)*	0600	9,068	8,579	489

PART II—FINANCIAL DATA

(Includes items 7 to 13 of the survey questionnaire)

FINANCIAL DATA REPORTED IN PART II ARE FOR THE FISCAL YEAR, WHICH BEGAN ON JULY 1, 1967 AND ENDED ON JUNE 30, 1968, OR YOUR INSTITUTION'S EQUIVALENT FISCAL YEAR. SPECIFY THE ENDING DATE IF DIFFERENT FROM ABOVE:

____

ALL FINANCIAL DATA REQUESTED ON THIS FORM SHOULD BE REPORTED IN THOUSANDS OF DOLLARS; FOR EXAMPLE, AN EXPENDITURE OF $25,342 SHOULD BE ROUNDED TO THE NEAREST THOUSAND DOLLARS AND REPORTED IN THE APPROPRIATE COLUMNS AS $25.

SECTION D
CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D)

If your institution did not have any current expenditures for separately budgeted research and development in 1967–68 check "none" in the space provided here and skip to Section E. ☐ None.

(Exclude expenditures for capital equipment and facilities.)

Item 7. **Current expenditures for separately budgeted research and development, by source of funds, 1967-68**

SOURCE OF FUNDS		THOUSANDS OF DOLLARS	
a. Federal Government	0710	$ 715,346	equals 8d and 9d (Col. 2)
b. State government	0720	290	
c. Local government	0730	-	
d. Foundations	0740	1,147	
e. Voluntary health agencies	0750	-	
f. Industry	0760	159	
g. Institution's own funds	0770	1,830	
h. Other sources	0780	158	
i. Total *(sum of a to h)**	0700	$ 718,930	equals 8d and 9d (Col. 1)

Item 8. **Total and federally financed current expenditures for separately budgeted research and development, by major cost item, 1967–68.**

COST ITEM		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Direct wages and salaries	0810	$ 341,517	$ 340,410
b. All other direct costs (including materials and supplies)	0820	279,556	278,067
c. Indirect costs reimbursed or reimbursable	0830	97,857	96,869
d. Total *(sum of a to c)**	0800	$ 718,930	$ 715,346

Item 9. **Total and federally financed current expenditures for separately budgeted research and development, by type of R&D activity, 1967-68**

TYPE OF R&D ACTIVITY		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Basic research	0910	$ 275,595	$ 273,399
b. Applied research	0920	231,207	230,275
c. Development	0930	212,128	211,672
d. Total *(sum of a to c)**	0900	$ 718,930	$ 715,346

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* Totals in items 7i, 8d (Col. 1) and 9d (Col. 1) should be identical. Similarly, figures reported in items 7a, 8d (Col. 2) and 9d (Col. 2) should be identical. If figures for the foregoing items are not consistent, please give reasons in "Remarks" at the end of the questionnaire.

Item 10. **Total and federally financed current expenditures for separately budgeted basic and applied research, by field of science, 1967-68**

FIELD OF SCIENCE		THOUSANDS OF DOLLARS	
		TOTAL (1)	FEDERAL GOVERNMENT (2)
a. Engineering (total)	1010	$ 75,448	$ 75,376
b. Physical sciences (total)	1020	$ 334,272	$ 333,381
(1) Astronomy	1021	22,263	21,566
(2) Chemistry	1022	50,260	50,255
(3) Physics	1023	249,499	249,310
(4) Physical sciences, NEC	1024	12,250	12,250
c. Environmental sciences (total)	1030	$ 20,450	$ 20,441
d. Mathematics (total)	1040	$ 18,289	$ 17,851
e. Life sciences (total)	1050	$ 26,959	$ 26,953
(1) Biological	1051	21,791	21,785
(2) Clinical medical	1052	4,658	4,658
(3) Life sciences, NEC	1053	510	510
f. Psychology (total)	1060	$ 5,216	$ 5,167
(1) Biological aspects	1061	46	46
(2) Social aspects	1062	1,069	1,049
(3) Psychological sciences, NEC	1063	4,101	4,072
g. Social sciences (total)	1070	$ 8,945	$ 7,335
(1) Economics	1071	149	138
(2) Political science	1072	336	319
(3) Sociology	1073	604	537
(4) Social sciences, NEC	1074	7,856	6,341
h. Other sciences, NEC (total)	1080	$ 17,223	$ 17,170
i. Total (*sum of a to h*)[a]	1000	$ 506,802	$ 503,674

[a] If your institution has development funds please do *not* distribute them by field of science. Totals in 10i (columns 1 and 2) should be identical with the sum of lines 9a and 9b (columns 1 and 2).

SECTION E
CURRENT EXPENDITURES FOR INSTRUCTION AND DEPARTMENTAL RESEARCH IN THE SCIENCES AND ENGINEERING

Item 11. **Current expenditures for instruction and departmental research in the sciences and engineering, by field of science, 1967-68**

FIELD OF SCIENCE		TOTAL INSTRUCTION AND DEPARTMENTAL RESEARCH (THOUSANDS OF DOLLARS)
a. Engineering	1110	$ -
b. Physical and environmental sciences	1120	-
c. Mathematics	1130	-
d. Life sciences	1140	-
e. Psychology	1150	-
f. Social sciences	1160	-
g. Other sciences, NEC	1170	-
h. Total (*sum of a to g*)	1100	$ -

Item 12. **Estimate the dollar amount of overhead or indirect costs allocable to the instruction and departmental research activities reported above (item 11).**

		THOUSANDS OF DOLLARS
	1200	$ -

SECTION F

CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION

Item 13. **Total and federally financed capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction, by field of science, 1967-68**

Prorate any expenditures intended for use in two or more fields of science and for R&D and graduate and undergraduate instruction. Do not include any materials and supplies reported under current expenditures in Section D or Section E. Include current fund expenditures for equipment and facilities as well as plant and other funds.

FIELD OF SCIENCE		THOUSANDS OF DOLLARS					
		TOTAL CAPITAL EXPENDITURES		R&D AND GRADUATE INSTRUCTION		UNDERGRADUATE INSTRUCTION	
		TOTAL (1)	FEDERAL GOVERNMENT (2)	TOTAL (3)	FEDERAL GOVERNMENT (4)	TOTAL (5)	FEDERAL GOVERNMENT (6)
a. Engineering	1310	$ 38,590	$ 37,547	$ 38,590	$ 37,547	$ -	$ -
b. Physical and environmental sciences	1320	88,577	87,524	88,577	87,524	-	-
c. Mathematics	1330	5,480	5,480	5,480	5,480	-	-
d. Life sciences	1340	2,869	2,869	2,869	2,869	-	-
e. Psychology	1350	90	58	90	58	-	-
f. Social sciences	1360	285	229	285	229	-	-
g. Other sciences, NEC	1370	607	576	607	576	-	-
h. Total *(sum of a to g)*	1300	$136,498	$134,283	$136,498	$134,283	$ -	$ -

REMARKS: *(If additional space is needed, attach an extra page)*

NAME OF PERSON SUBMITTING THIS FORM	TITLE
NAME OF INSTITUTION	ADDRESS *(number, street, city, state, ZIP code)*
AREA CODE, TELEPHONE NO., EXT.	DATE

APPENDIX E

Reproduction of Covering Letter and Instructions

Page

Covering Letter and Instruction for NSF Forms 411 and 412[1] 139

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[1] The questionnaires used in the survey are reproduced in appendixes B, C, and D. NSF Form 411 in appendix C was used to obtain data for the university or college as a whole, while NSF Form 412 was used to obtain separate data for medical schools and university-administered FFRDC's, respectively.

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

January 31, 1969

To the President:

The National Science Foundation requests your cooperation in its biennial Survey of Scientific Activities of Institutions of Higher Education, 1967–68. The enclosed survey questionnaire seeks information on the financial and manpower resources allocated to science and enginering programs at your institution.

This survey of universities and colleges is an integral part of the NSF's program of periodic surveys and studies of scientific activities in various sectors of the economy, including industry, government, education, and other nonprofit organizations. As you may know, the National Science Foundation is the Federal agency responsible for obtaining factual data on resources allocated to science and engineering activities throughout the national economy. Such information is needed by the National Science Foundation and other government and private organizations concerned with formulating and evaluating policies and programs to strengthen the educational and research capabilities of the Nation's universities and colleges in the sciences and engineering.

I want to call your attention to the fact that the manpower information requested in this inquiry differs significantly from that which will be requested in November 1969 under the CASE reporting system, as described in Dr. Leland J. Haworth's Special Notice to Universities and Colleges, dated November 21, 1968. The CASE report refers only to the participation of faculty, students, and other personnel directly involved in certain types of federally supported projects, whereas the present survey requests information on all activities of all scientific and technical personnel employed by universities and colleges.

Also enclosed is a self-addressed postcard requesting the name and title of the official assigned to complete the questionnaire for your institution. Your prompt return of this postcard to the National Science Foundation will insure that any inquiries regarding your institution's participation in the survey will be directed to the appropriate official. If any questions arise regarding the interpretation of the survey questionnaire, please write or call Dr. Joseph H. Schuster (Area Code 202, 632–4080) at the Foundation's Office of Economic and Manpower Studies.

The Foundation is grateful for your past cooperation and will appreciate your participation in this survey.

Sincerely yours,

Charles E. Falk

Charles E. Falk
Planning Director

Enclosures

NSF Forms 411 and 412
Instruction Sheet

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

INSTRUCTIONS FOR SURVEY OF SCIENTIFIC ACTIVITIES OF INSTITUTIONS OF HIGHER EDUCATION, 1967–68

OUTLINE OF INSTRUCTIONS

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GENERAL

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PART I. PERSONNEL DATA

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Section F. Capital Expenditures for Scientific and Engineering Facilities and Equipment for Research, Development, and Instruction (Item 13) 10

GENERAL

The National Science Foundation requests your cooperation in completing the attached questionnaire covering the personnel and financial characteristics of your institution as they relate to the sciences and engineering.

The purpose of this survey is to obtain statistical data on the resources devoted to scientific activities at institutions of higher education. This information will assist the National Science Foundation to fulfill its responsibilities in supporting basic research and education in the sciences and in the formulation of recommendations on national science policy in keeping with the National Science Foundation Acts of 1950 and 1968 and Executive Order No. 10521 of March 17, 1954.

Each institution included in this survey is requested to supply data on the number of scientific and technical personnel engaged in scientific and engineering activities; the total current expenditures for separately budgeted (i.e., organized) research and development (R&D); current expenditures for instruction and departmental research in the sciences and engineering; and capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction. Because information on some items may not be available from records normally maintained by your institution, reasonable estimates for such items will be satisfactory. Enter "none," where appropriate, rather than leave an item blank.

Please complete the original copy and return it in *30 days*. If you have any questions regarding information requested on this form, write to Universities and Nonprofit Institutions Studies Group, National Science Foundation, Washington, D.C., 20550. Additional forms may be obtained by writing to the above address.

PERIOD COVERED BY THE REPORT

Personnel data (Part I) are to be reported as of mid-January 1969 (the payroll period containing January 12, 1969), or as close thereto as possible.

The time period covered in the financial sections of the form (Part II) is the fiscal year which began on July 1, 1967, and ended on June 30, 1968, or your institution's equivalent fiscal year ending in 1968.

REPORTING UNITS

This survey covers research, development, and other scientific activities of all branches and other units of the parent institution, both on and off the main campus, in the United States and its Territories.

Every institution should complete a white form presenting aggregate data for the entire institution (NSF Form 411). If data are requested for one or more units of an institution, blue forms (NSF Form 412) will be attached with the names of the units concerned entered on them. The blue form should be completed for only that part of the institution which is specified on the form. If your institution has not received forms for all such units, as described in the instructions below, additional forms will be supplied upon request.

For purposes of this survey, the various organizational units of colleges and universities for which a blue questionnaire (NSF Form 412) is requested are defined as follows:

Federally Funded Research and Development Centers, as designated by Federal agencies, are R&D organizations exclusively or substantially financed by the Government, and administered on a contractual basis by educational institutions or other organizations.

Medical schools are those two- or four-year schools of medicine approved by the Council on Medical Education and Hospitals and the Association of American Medical Colleges. Included are hospitals or clinics owned, operated, or controlled by universities and integrated operationally with the clinical programs of their medical schools. Also included are research bureaus or institutes which are integral parts of medical schools. In addition, include those research bureaus and institutes which are nonuniversity owned but are affiliated with the medical school and any university bureaus and institutes which may be outside the departmental structure of universities but whose senior research staff members hold teaching appointments with medical schools.

Alternative Reporting Procedure—Although NSF Form 411 is intended to be used to report data for the institution as a whole, it is recognized that some institutions may find it convenient to submit separate reports for branches or other organizational units. If your institution prefers to submit separate reports for branches or other organizational units rather than a single report covering the entire institution, list in the space provided on the first page of NSF Form 411 all branches or other organizational units of your institution which have been excluded from NSF Form 411 and for which separate reports are being submitted. This procedure may be used in the case of separate organizational units for which separate data have been provided on NSF Form 412.

NOTE: Separate data on the scientific activities of agricultural experiment stations and affiliated colleges of agriculture *are not requested* in this survey. However, data for these organizational units should be included in the report for the institution as a whole.

PART I—PERSONNEL DATA

(Includes items 1 to 6 of the survey questionnaire)

The survey requests data on the number of professional and technical personnel employed or engaged in science and engineering activities in all branches and other organizational units of your institution, whether on or off the main campus, in the United States or in its Territories. Include all such personnel who were paid a salary or stipend and members of religious orders who received no remuneration while employed at the institution. Exclude personnel on sabbatical or other leave status and personnel employed in branches of your institution located in foreign countries. Also exclude voluntary workers, such as voluntary staff members at medical and dental schools.

Report data for scientific and technical personnel employed as of mid-January 1969, or as close to that date as possible.

Categories of scientific and engineering personnel for whom the survey requests separate data are as follows: Full-time and part-time scientists and engineers (Section A), graduate students engaged part time as scientists and engineers (Section B), and technicians employed in the sciences and engineering (Section C). Additional information regarding procedures to be used in reporting personnel data is included in instructions relating to individual Sections or items.

The following instructions relate primarily to the reporting of scientists and engineers by those institutions with separate administrative units, for which NSF Form 412 (blue questionnaire) will be prepared.

A. For *Federally Funded Research and Development Centers* include data for scientists and engineers holding appointments at the center. Personnel holding joint appointments in more than one organizational unit including a center are to be reported for the center only if they held their principal appointments with the center.

B For *medical schools* include data for all scientists and engineers with primary appointments in the school, but exclude unpaid voluntary staff. Include scientists and engineers employed by hospitals or clinics owned, operated, or controlled by the university and integrated operationally with the clinical programs of the medical school. Include residents employed in such hospitals or clinics, but exclude interns. Student health services are not to be included in the form for the medical school.

Classification of Fields of Employment

Listed below are the broad and detailed fields of employment with additional explanation of coverage, which are to be used in classifying scientists and engineers included in Part 1, items 1 through 6. Please classify persons employed in interdisciplinary or multidisciplinary specializations in the listed fields with which their activities (teaching, research, or other) are most closely identified.

Engineers:
- Aeronautical
- Chemical (includes ceramic)
- Civil (includes architectural, structural, sanitary)
- Electrical (includes electronic)
- Mechanical
- Other (includes agricultural, industrial, mining and metallurgical, nuclear, textile)

Physical scientists:
- Chemists
- Earth scientists (includes geologists, geophysicists, meteorologists, oceanographers, physical geographers)
- Physicists
- Other physical scientists (includes astronomers, metallurgists)

Mathematicians: (includes statisticians and computer scientists)

Life scientists:
- Agricultural scientists (includes agronomists, foresters, husbandrymen, horticulturists, soil scientists)
- Biological scientists (includes anatomists, bacteriologists, botanists, geneticists, microbiologists, pathologists, pharmacologists, physiologists, zoologists)
- Medical scientists (includes all branches of medical, dental, veterinary medicine and other clinical fields)

Psychologists: (includes clinical, social, educational, industrial and personnel, counseling and guidance, and experimental psychologists)

Social scientists:

Economists (includes agricultural economists, econometricians)

Sociologists

Political scientists

Historians

Other social scientists (includes anthropologists, archeologists, demographers, social and economic geographers)

Section A—Number of Scientists and Engineers

(Exclusive of Graduate Students)

(Note: Figures on graduate students engaged part time as scientists and engineers should be reported in Section B)

This section requests data on full-time and part-time scientists and engineers employed or engaged in teaching, research and development, or other activities. The reporting institution is requested to use its own definition of what constitutes a full-time appointment.

Scientists and engineers include salaried personnel of your institution who have received a bachelor's degree or higher or, if foreign educated, academic training equal to a bachelor's degree or higher, and who are working at a professional level (a level at which the knowledge acquired by such academic training is essential in the performance of duties) in the sciences or engineering.

Item 1. Full-time scientists and engineers, by field and function in which primarily employed, and total full-time equivalents, by function, January 1969.

In items 1a to 1g, the functional classification of professional personnel into teaching (column 2), R&D (column 3) and other activities (column 4), should be based on the function in which the person is primarily engaged or employed at the institution. For example, a person engaged in two or all three of the specified functional categories should be classified in the function in which he spends the largest proportion of his time. In classifying personnel by function, take into account only activities carried out under the auspices or the official encouragement of your institution. Exclude outside consulting work and teaching not performed under the auspices of your institution.

In classifying an individual under a particular category (teaching, research and development, or other activities), take into consideration all official activities even if carried on in a school or department other than the one in which he holds his principal appointment.

Teaching (column 2) is defined as encompassing those activities connected with degree credit courses or which are intended to lead ultimately to the granting of degrees or certificates or to professional certification or licensing. Included are such functions as instruction and training performed in connection with degree credit courses and the administration of such instruction and training. Also include instruction of interns, residents, and other professional personnel receiving advanced training such as postdoctoral fellows or trainees.

Time spent by faculty or other staff members in supervising the thesis work of graduate students is considered to be part of the teaching function.

Research and development include basic and applied research in the sciences and in engineering, and design and development of prototypes and processes (column 3). Included in this function is the preparation for publication of books and papers describing the results of the specific research and development, if carried out as an integral part of that research and development. Also included is the administration of research and development.

Under *other activities* (column 4) report all professional personnel not primarily employed in teaching or research and development, as defined above. Examples of such activities are agricultural demonstration work; adult education (if not degree credit); dissemination of scientific information; student health services; diagnosis and treatment of patients in offices, hospitals, clinics, and out-patient facilities; and general administration.

In item 1h, classify personnel reported in item 1g in each of the three functions on a full-time-equivalent basis. Apportion time of staff members among the three functions on the basis of the proportion of effort or time spent in each of the functions. For example, 24 individuals devoting three-fourths time to teaching and one-fourth to research and development should be reported as 18 in teaching and 6 in research and development. *Calculate full-time equivalents to the nearest whole number.* In item 1h, figures in columns 2, 3, and 4 should add to the total in column 1.

Item 2. Full-time scientists and engineers, by field in which *primarily* employed and highest earned degree, January 1969.

Report scientists and engineers in the field in which they are primarily employed by the institution. Personnel engaged in administration or community service should be classified in the field most closely related to their present employment at the institution.

For the purposes of this survey, earned degrees are classified in four categories as defined below:

a. Ph.D. or Sc.D. degrees include all such earned degrees. Individuals holding *both* the Ph.D. (or Sc.D.) degree and a first-professional degree, such as the M.D., should be included in column 2.

b. Include individuals whose highest earned degrees are first-professional medical degrees that indicate the completion of the academic requirements based on programs that require at least two academic years of previous college work for entrance and require a total of at least six academic years of college work for completion. Specifically, include in column 3 first-professional degrees in Medicine (M.D.), Dentistry (D.D.S. or D.M.D.), Veterinary Medicine (D.V.M.), Chiropody or Podiatry (D.S.C. or D.P.), Optometry (O.D.), and Osteopathy (D.O.). Individuals holding *both* the Ph.D. (or Sc.D.) degree and a first-professional degree, such as the M.D., should be included in column 2 as mentioned in (a) above.

c. Master's degrees include all second-level degrees above the bachelor's degree and below the Ph.D. or Sc.D. and M.D., D.D.S., and other first-professional medical degrees (column 4).

d. Report all individuals whose highest earned degree is the bachelor's degree or a four- or five-year first-professional degree, or who have the equivalent in experience, even if they have not earned such a degree (column 5).

Item 3. Part-time scientists and engineers, by field and function in which primarily employed; and total full-time equivalents, by function, January 1969.

Instructions for item 1 relating to classification by field and function also relate to part-time professional staff in item 3.

In estimating the full-time equivalents of part-time personnel in item 3h, use your institution's definition of such equivalents. Thus, four part-time instructors, each of whom teaches one 3-hour credit course, may be reported as one full-time equivalent in teaching, if four such credit courses were considered the load of a full-time instructor at your institution. *Calculate full-time equivalents to the nearest whole number.*

Item 4. Part-time scientists and engineers, by field in which primarily employed and highest earned degree, January 1969.

The reporting institution is requested to use its own definition of what constitutes part-time employment. Instructions for item 2 relating to classification by field and highest earned degree also relate to part-time professional staff in item 4.

Section B—Number of Graduate Students Engaged Part Time as Scientists and Engineers

Item 5. Graduate students receiving compensation for part-time services as scientists and engineers at your institution, by field and function in which primarily engaged; and total full-time equivalents, by function, January 1969.

Include all graduate students who devote part of their time to a course of study designed to lead to an advanced degree in the sciences or engineering and who also receive compensation from your institution for part-time professional services performed in the sciences or engineering. This category includes (a) graduate students receiving salaries or wages for their services as teaching or research assistants and (b) graduate students receiving duty stipends, such as scholarships, fellowships, or traineeships, that require the performance of professional services in the sciences or engineering at your institution. Exclude graduate students receiving non-duty stipends and others who may be engaged in scientific and engineering activities on a voluntary basis.

Instructions in item 1 regarding classification by field and function may be used in classifying graduate students reported in item 5.

Section C—Number of Technicians Employed in the Sciences and Engineering

Item 6. Technicians, by field and function in which primarily employed, January 1969.

Technicians include all persons employed in positions which involve technical work at a level requiring knowledge of engineering, mathematics, physical science, life science, psychology, or social science comparable to that acquired through formal post-high school training (less than a bachelor's degree), such as that obtained at technical institutes and junior colleges or through equivalent on-the-job training or experience. Some typical job titles include laboratory technician or assistant, physical science aide, engineering aide, statistical aide, draftsman, and computer programmer.

Do not include graduate students who were reported in item 5. Also exclude craftsmen such as electricians, carpenters, machinists, etc. In the case where undergraduate students, juniors or seniors, are employed in R&D activities, they may, where applicable, be included as technicians.

PART II—FINANCIAL DATA

(Includes items 7 to 13 of the survey questionnaire)

Section D—Current Expenditures for Separately Budgeted Research and Development (R&D)

(Expenditures for capital equipment and facilities are to be excluded here but reported in Section F.)

In general, financial data requested in this survey are intended to be consistent with principles of financial accounting for institutions of higher education presented in *College and University Business Administration* (Washington, D.C.; American Council on Education, 1968). Similarly, data in this survey are related to financial data reported in U.S. Office of Education's Higher Education General Information Survey, "Financial Statistics of Institutions of Higher Education." It should be noted, however, that there are a few terminological and other differences between the present survey and the Office of Education survey cited above. For example, the present survey uses the term, "Research and Development," to denote the entire spectrum of separately budgeted R&D activities, as defined above, whereas the Office of Education survey uses the term, "Organized Research."

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported in the appropriate columns as $25.

DEFINITION OF RESEARCH AND DEVELOPMENT (R&D)

Research and development include basic and applied research in the sciences and in engineering, and design and development of prototypes and processes.

Research is a systematic, intensive, study directed toward fuller knowledge of the subject studied. Research may be either basic or applied.

Basic research is directed toward an increase of knowledge; it is research where the primary aim of the investigator is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.

Applied research is directed toward the practical application of knowledge. The definition of applied research differs from the definition of basic research chiefly in terms of the objectives of the investigator.

Development is the systematic use of knowledge directed toward the design and production of useful prototypes, materials, devices, systems, methods, or processes. It does not include quality control or routine product testing.

Classification of Fields of Science

Listed below are illustrative disciplines included in engineering and the various fields of science for which separate data are requested in items 10, 11, and 13 of Part II of the questionnaire. *Classification of Fields of Employment* which is to be used in classifying scientists and engineers included in Part I, items 1 through 6 is shown on pages 3 and 4.

ENGINEERING

AERONAUTICAL:	Aerodynamics
ASTRONAUTICAL:	Aerospace, space technology
CHEMICAL:	Petroleum, petroleum refining, process
CIVIL:	Architectural, hydraulic, hydrologic, marine, sanitary and environmental, structural, transportation
ELECTRICAL:	Communication, electronic, power
MECHANICAL:	Engineering mechanics
METALLURGY AND MATERIALS:	Ceramic, mining, textile, welding
ENGINEERING, NEC:	Agricultural, industrial and management, nuclear, ocean engineering, systems

PHYSICAL SCIENCES

ASTRONOMY:	Laboratory astrophysics, optical astronomy, radio astronomy, theoretical astrophysics, x-ray, gamma-ray, neutrino astronomy

CHEMISTRY:	Inorganic, organo-metallic, organic, physical
PHYSICS:	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma
***ENVIRONMENTAL SCIENCES* (Terrestrial and Extra-terrestrial)**	
ATMOSPHERIC SCIENCES:	Aeronomy, solar, weather modification, extra-terrestrial atmospheres, meteorology
GEOLOGICAL SCIENCES:	Engineering geophysics, general geology, geodesy and gravity, geomagnetism, hydrology, inorganic geochemistry, isotopic geochemistry, organic geochemistry, lab geophysics, paleomagnetism, paleontology, physical geography and cartography, seismology, soil sciences
OCEANOGRAPHY:	Chemical oceanography, geological oceanography, physical oceanography, marine geophysics
MATHEMATICS	Algebra, analysis, applied mathematics, computer science, foundations and logic, geometry, numerical analysis, statistics, topology
LIFE SCIENCES	
BIOLOGICAL:	Anatomy, animal sciences, bacteriology, biochemistry, biogeography, biological oceanography, biophysics, ecology, embryology, entomology, evolutionary biology, genetics, immunology, microbiology, nutrition and metabolism, parasitology, pathology, pharmacology, physical anthropology, physiology, plant sciences, radiobiology, systematics
CLINICAL MEDICAL:	Internal medicine, neurology, ophthalmology, preventive medicine and public health, psychiatry, radiology, surgery, veterinary medicine, dentistry, physical medicine and rehabilitation, pharmacy, podiatry
PSYCHOLOGY	
BIOLOGICAL ASPECTS:	Experimental psychology, animal behavior, clinical psychology, comparative psychology, ethology
SOCIAL ASPECTS:	Social psychology; educational, personnel, vocational psychology and testing; industrial and engineering psychology; development and personality
SOCIAL SCIENCES	
ECONOMICS:	Econometrics and economic statistics; history of economic thought; international economics; industrial, labor and agricultural economics; macroeconomics; microeconomics; public finance and fiscal policy; theory; economic systems and development.
POLITICAL SCIENCE:	Area or regional studies, comparative government, history of political ideas, international relations and law, national, political and legal systems; political theory, public administration
SOCIOLOGY:	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and social welfare, sociological theory
SOCIAL SCIENCES, NEC:	Anthropology, history, linguistics, socio-economic geography, and research in education
OTHER SCIENCES, NEC	To be used only when multidisciplinary and interdisciplinary aspects make it impossible to classify the project or employment under one primary field.

Item 7. Current expenditures for separately budgeted research and development, by source of funds, 1967–68.

Source of funds refers to immediate sources rather than ultimate sources of funds concerned. For example, funds received by your institution from a foundation should be reported under that source, even if industry was the original source of some or all of the foundation's funds.

Under *Federal Government* (item 7a) include grants and contracts earmarked for research and development by all agencies of the Federal Government. In reporting Federal funds for research and development, include those Federal funds channeled through State agencies. *Exclude R&D contracts subcontracted by your institution to be performed by other organizations.*

Under *State government* (item 7b) include funds designated for R&D by the State government and its agencies.

Under *Local government* (item 7c) include funds designated for R&D by county, municipal, or other local governments and their agencies.

Under *Foundations* (item 7d) include grants and contracts earmarked for R&D by nonprofit philanthropic foundations and trusts not affiliated with your institution, such as the Carnegie, Ford, Kresge, or Rockefeller Foundations. Funds from foundations which are affiliated with, or grant solely to, your institution should be included under *Institution's own funds.*

Under *Voluntary health agencies* (item 7e) include grants and contracts specified for R&D by voluntary health agencies, such as the American Cancer Society and the American Heart Association. Funds specifically designated for R&D and derived from a health agency that is a unit of a State or local government should be reported under *State* or *local government.* Funds from professional societies such as the American Medical Association and the American Dental Association should be reported under *Other sources.*

Under *Industry* (including trade associations) (item 7f) include all grants and contracts allocated to R&D by profit-making organizations, whether engaged in production, distribution, research, service, or other activities. Do not include grants and contracts from nonprofit foundations financed by industry, which should be reported under *Foundations.*

Under *Institution's own funds* (item 7g) include any funds which the institution was free to designate for R&D and which were in fact so budgeted. The sources of these funds may include endowment income; tuition and fees; general-purpose State or local government appropriations; and general-purpose grants from industry, foundations, health agencies or other outside sources, provided these were unrestricted funds and were utilized by your institution for separately budgeted R&D. Also include in item 7g all costs incurred in the performance of separately budgeted R&D projects carried out under Federal or non-Federal sponsorship that were defrayed by your institution out of its own funds, including costs defrayed in accordance with cost sharing arrangements.

Under *Other sources* (item 7h) report any additional funds received from outside sources other than those already noted, and which were earmarked for R&D *by the source.* Examples include gifts, grants, or contracts received from private individuals or professional societies, and designated for R&D by them.

Item 8. Total and federally financed current expenditures for separately budgeted research and development, by major cost item, 1967–68.

The purpose of this question is to obtain a cost breakdown of the current expenditures associated with the performance of research and development at your institution. For each of the cost items for which separate data are requested, indicate the amount funded by the Federal Government (column 2). The total shown in 8d (column 1) should be the same as the totals in item 7i and item 9d (column 1). Similarly, the total shown for Federal Government in item 8d (column 2) should be the same as totals in item 7a and in item 9d (column 2).

In item 8a, report direct salaries and wages charged to separately budgeted R&D accounts of your institution. Include costs of benefits only where they can be directly attributed to the costs of separately budgeted research and development; otherwise, include such costs under item 8c, indirect costs reimbursed or reimbursable.

In item 8b, report all expenditures for materials and expendable equipment.

In item 8c, report all indirect (overhead) costs attributable to separately budgeted R&D expenditures which were reimbursed or will be reimbursed by the sponsoring organization. Do not include any direct costs incurred which *were not* reimbursed and *will not* be reimbursed.

Item 9. Total and federally financed current expenditures for separately budgeted research and development, by type of R&D activity, 1967–68.

Types of R&D activity for which separate data are requested (basic research, applied research, and development) are defined on page 7 of the Instructions. It is recognized that your records may not yield exact figures on amounts expended for each of the three categories. In such cases reasonable estimates of the breakdown will be satisfactory. The totals in item 9d should be the same as those in item 8d.

Item 10. Total and federally financed current expenditures for separately budgeted basic and applied research, by field of science, 1967–68.

In column 1, include all current expenditures for total separately budgeted research, by field of science as shown on pages 7 and 8, whether such expenditures derive from outside sources or your institution's own funds, and whether from contracts, grants, gifts, endowments (income or principal), State and local government appropriations, or other sources, provided the funds were separately budgeted for research and were expended in the fiscal year 1967–68. Also include any indirect costs reimbursed or reimbursable by outside sponsors of research projects. Where it is not possible to identify expenditures for the year, receipts may be substituted.

In column 2, classify total separately budgeted research financed by the Federal Government, by field of science.

Totals in item 10i (columns 1 and 2) should equal the sum of items 9a and 9b (columns 1 and 2).

Section E—Current Expenditures for Instruction and Departmental Research in the Sciences and Engineering

(Expenditures for capital equipment and facilities are to be excluded here but reported in Section F.)

Financial data requested in this section are intended to be consistent with data reported in U.S. Office of Education's Higher Education General Information Survey, *"Financial Statistics of Institutions of Higher Education."* Data requested should be derived from or estimated on the basis of Current-Funds Revenue (Revenue for Education and General Purposes) and Current-Funds Expenditures (Educational and General Expenditures).

Current expenditures for instruction and departmental research include the salaries of department heads, faculty members, secretaries and technicians, office and laboratory supplies, and other expenses. All expenditures incurred for instructional programs in science and engineering subjects for students pursuing degree-credit courses of study which lead generally to a certificate or degree should be included.

Item 11. Current expenditures for instruction and departmental research in the sciences and engineering, by field of science, 1967–68.

Report all current expenditures of the instructional departments, colleges, and schools of the institution in the sciences and engineering, by field of science, as described on pages 7 and 8.

Item 12. Estimate the dollar amount of overhead (or indirect) costs allocable to the instruction and departmental research activities reported above (item 11).

Current expenditures for instruction and departmental research in the sciences and engineering (item 11) represent *direct* expenditures incurred by your institution in carrying out these functions. The purpose of item 12 is to obtain an estimate of the overhead or indirect costs associated with these direct expenditures. Such overhead or indirect costs include an appropriate share of the institution's expenditures for general administration, student services, libraries, and the operation and maintenance of physical plant.

Section F—Capital Expenditures for Scientific and Engineering Facilities and Equipment for Research, Development, and Instruction

This section covers capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction during 1967–68. Report funds expended during 1967–68 for facilities which were in process in that year and for facilities which were completed that year. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be excluded.

Facilities and equipment expenditures include the following: (a) fixed equipment such as built-in equipment and furnishings (hoods, fixed laboratory tables and benches, and ventilation equipment); (b) movable scientific equipment such as oscilloscopes, pulse-height analyzers, spectrometers, and plasma and protein separators; (c) movable furnishings such as bookcases, desks, file cabinets, tables, and simple tools; (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; and (e) special separate facilities used to house scientific apparatus such as hypersonic tunnels, accelerators, and oceanographic vessels.

Current-fund expenditures for capital equipment and facilities should be reported in this section and should be excluded from Sections D and E. Expenditures from plant and other funds for facilities and equipment should likewise be included in this section.

Item 13. Total and federally financed capital expenditures for scientific and engineering facilities and equipment for research, development, and instruction, by field of science, 1967–68.

Capital expenditures should be divided into two parts: (1) R&D and graduate instruction, and (2) undergraduate instruction. Further, classify such expenditures by broad fields of science, as follows: engineering, physical and environmental, mathematics, life, psychology, social, and other sciences.

Prorate capital expenditures for multi-purpose structures. The space utilized for particular functions may be used as a guide in prorating. Thus, if 50 percent of the total square footage of a science building is allocated to R&D and graduate instruction, the remaining 50 percent to undergraduate instruction, then capital expenditures should be distributed accordingly between these two functions. The following guidelines may be helpful in determining the functional usage of space: (1) The term *research and development* (R&D) was previously defined on page 7 of the Instructions. *Graduate instruction* is a course of study offered primarily to students who have attained a first-level degree and is designed to lead to a second-level or doctoral degree in a given field. Included is post-doctoral education which is defined as advanced training beyond the Ph.D. or Sc.D. degree, as well as the training of interns and residents. (2) *Undergraduate instruction* is a course of study designed to lead to the bachelor's or first-professional degree in a given field. Instruction of students enrolled in a medical school for the purpose of attaining the M.D. degree should be classified as undergraduate instruction.

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